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THE ZOOLOGIST:

A

POPULAR MONTHLY MAGAZINE

OF

NATURAL HISTORY,

AND

JOURNAL FOR RECORDING FACTS AND ANECDOTES

RELATING TO

QUADRUPEDS, BIRDS, REPTILES, FISHES, MOLLUSKS,
INSECTS, WORMS, ZOOPHYTES, &c.

THEIR HABITS, FOOD, RETREATS, OCCASIONAL APPEARANCE,
MIGRATIONS, NESTS AND YOUNG.

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The Crocodile.—Mr. Smith's observation from Herodotus is worth notice,—the smallness of the egg compared with the size of the crocodile. Herodotus also makes another curious observation—and a true one: he says the crocodile is the "only *wild beast* which has no tongue," and therefore, as the saying is, this hideous animal may be called "unique."—*H. W. Newman; Hillside, Cheltenham, February* 27, 1864.

A Five-spined Stickleback in Britain.—Are you aware of the occurrence, in Britain, of a stickleback with five spines? I recently took a hundred and forty of these little fishes for examination, from a trout stream near Warrington. About one-half of them were the three-spined smooth-tailed stickleback, the other half consisting chiefly of the ten-spined S. pungitius, *L.*, with three or four of the four-spined G. spinulosus, and one nondescript species with five spines. In this specimen, which is about 1½ inch long, the spines are long and slender, the second one being the longest; the forehead and the lower jaw apparently form a more obtuse angle than in the allied species G. spinulosus, thus giving the head a truncate appearance. I presented this, with the four-spined ones, to Mr. Cooper, for the Museum, and he placed them in spirits. Is it not strange that the species which Yarrell describes as the commonest (G. trachurus) should not be found about here?—*John Peers; Warrington, May* 9, 1864.

[This information is highly interesting, and it seems a favourable opportunity for expressing my opinion that our British species of Gasterosteus are at present very imperfectly understood. I am only acquainted with three species: (1) G. aculeatus; common everywhere, and embracing Yarrell's G. trachurus, G. semiarmatus and G. leiurus, which I find it impossible to separate; (2) G. lævis of Cuvier = G. pungitius of Yarrell; and, lastly (3), G. spinachia, a very well known marine species, and a great favorite in our aquariums.—*Edward Newman*].

Angel-fish and Pilot-fish at Penzance.—On the 7th inst., in Mount's Bay, I took an angel-fish (or monk; not the angler, sometimes also called angel) nearly four feet long over all, and two feet nine inches across the wings. Whilst lying in the boat the fish extruded naturally twelve young ones, all alive, perfect in shape, and about nine inches long. After it was landed it added nine more to its family, but this time under the influence of the knife. I caught a similar fish about this time last year, from which I took thirteen young ones. On the 8th inst. I had brought to me a pilot-fish of unusually dark colour, the transverse bands almost black, and the ground colour a silvery gray, having a perfectly smooth tongue, and on the vomer a rough, rasp-like bone, but no tooth. In the sacred cause of Science I ate that pilot-fish: I found it something like a dry mackerel. This morning I captured a P. corrugatus, and about ten days ago I took a Galathea strigosa; both of them my second specimens here.—*Thomas Cornish; Penzance, June* 11, 1864.

Pilot-fish and Large Mackerel at Penzance.—A pilot-fish, not so large as the one I noted two or three days ago, has just followed one of our mackerel boats into the harbour here, where it was caught in a bucket. It was very dark in colour, but more blue than the one I had. I have just measured a mackerel having the following dimensions:—Length, from eye to fork, 14¾ inches; length over all, 17¾ inches. Girth, round the shoulder at the origin of the pectorals, 8¼ inches; greatest girth, over the dorsal, precisely where its hinder end touches the back when laid flat, 9¾ inches. Weight, 2 lbs. 4 oz.—*Id.; June* 14, 1864.

Rock-boring Snails; Correspondence between the late Dr. Buckland and the late Mr. William Baker. Communicated by the late THOMAS CLARK, of Bridgwater.

[IT is my mournful duty to record the death of Thomas Clark, whose love of Natural History and zeal for the promotion of the Science were only equalled by his amiable qualities as a man, and the unwearying readiness and kindness with which he communicated his varied knowledge, even to the end of his long and useful life. It will be seen that so lately as the 16th of May he was still pursuing the interesting inquiry which forms the subject of this memoir. He was taken ill shortly after this excursion, and breathed his last on the 29th,—in peace with all men. In Thomas Clark I have lost a true friend: one of that cherished few who know not how to change.—*Edward Newman*].

The notices which have recently appeared in the 'Zoologist' (Zool. 8932 and 9012), of perforations in stone made apparently by some species of snail, have reminded me that this subject had the attention of the late William Baker, of Bridgwater, more than twenty years ago, as well as of the late Professor Buckland and some others. I well remember William Baker telling me of his observing the perforated stone on Cannington Park, an isolated hill of mountain limestone, about four miles north-west of Bridgwater, and his decided opinion that the perforations were the work of the snails. I have been obliged by one of his daughters with his correspondence on the subject, with permission to make use of extracts from the various letters. I have made free use of this permission, and I send with this note the extracts I have made, hoping they may be of sufficient interest to appear in the 'Zoologist.'

The snail to which the perforations are attributed, principally at least, is the common large snail, Helix aspersa of Turton's 'Manual,' or H. hortensis of his 'Conchological Dictionary.' William Baker, in these extracts, has given both these names to the same species; he does not by H. hortensis mean the hortensis of Lister, Montagu and others. From the interesting paper in the 'Zoologist' (Zool. 9012), on the "Boring Snail of the Bois des Roches," by the Rev. Alfred Merle Norman, M.A., it appears that M. Bouchard-Chatereaux, in his treatise on the subject, tells us that the snail in question is Helix hortensis. Is it not probable that by this name he also means the H. aspersa of Turton's 'Manual'? If so, Professor Buckland is no doubt correct in saying that the snail which perforates the limestone at Tenby is the same as that of the Bois des Roches. It appears that twenty or thirty years ago, before the appearance of Turton's 'Manual,' and when his 'Dictionary' was in much request, the common large snail was called hortensis as frequently at least as aspersa.

William Baker to Prof. Buckland.

Bridgwater, Oct. 6, 1841.

In looking over the report of the proceedings at the Devonport meetings in the 'Athenæum,' I observed your notice of garden snails perforating limestone. I several years ago found numerous perforations in the under sides of naked rock on the upper part of Cannington Park, and many of the perforations were occupied by the common snail (Helix aspersa or hortensis). I have since found similar perforations and their tenants in the jew stone of the lias at Wedmore and other places. I trouble you with a few pieces of the Cannington Park stone, showing marks of very recent operations of the snail, and some of more remote, as evidenced by the covering of lichens on the latter. When I showed some specimens to our dear old friend Mr. Anstice, he was much interested, and we have made use of the discovery to illustrate the borings of the Pholadæ, nearly in the same way that the subject was treated by you and others at Devonport.

Prof. Buckland to William Baker.

Oxford, Oct. 27, 1841.

Pray accept my best thanks for * * * and also for your specimen of snail holes from Cannington Park, and the confirmation your observations afford of the power these animals possess of making holes on the limestone rocks they habitually and for a long series of years frequent. I have as yet only seen these holes on the compact limestone of the mountain and transition formations.

Prof. Buckland to William Baker.

Oxford, April 8, 1842.

Your discoveries of abundant snail-holes is very interesting and confirmative. You will oblige me by a note detailing your observations more at length, which I may read to the Geological Society, where there are still many sceptics, who will not believe it because they have so long overlooked it. Can you on your visit take a strong wedge or lever and good hammer, and get for the Museum at Oxford and the Geological Society a couple of large demonstrative specimens? Are the holes equally numerous on all sides of the hill, or on what aspect do they more abound? Are the apertures always so much inclined downwards that rain water will never lodge in them? Do they seem to have been made by more than one species of snail, and what species? I found them in Cumberland made by small wood snails.

William Baker to Prof. Buckland.

May 14, 1842.

I have now procured [from Cannington Park] some large and good specimens of the perforated limestone. The most illustrative specimen shows weather-worn indentations and holes distinct from those made by snails. It weighs more than ½ cwt. Shall I reduce it by chipping off the least interesting parts? The effects of the weather are seen on the upper surface and sides of the stones, and the operations of the snails are from the sides and under parts, commencing near the surface of the ground. The holes are unlike those of Pholadæ and the boring Mytilidæ; they are pretty large at the entrances, enlarging and often branching within in very irregular courses and dimensions; their direction is generally upwards, and they sometimes pass quite through to the top of the stone in smaller perforations; several holes sometimes run one into the other, and form capacious chambers, sufficient for the habitation of many snails. The outer parts of the holes are often lined with minute lichens, but within they show more and more freshness towards the further extremities, where there is generally evidence of very recent operation. These perforations are found on all parts of the hill, but more abundantly in blocks partly concealed by small bushes and herbage. They are in blocks which stand out from the turf, and in those which have been buried by earth washed over them by rains. There are none to be found in places which are not now accessible to snails, or which have not been so recently. Almost all the holes contain either living snails or shells. The only species which I have found in them are Helix aspersa and nemoralis. The former are the most abundant; indeed, I believe the perforations are made chiefly by this species. On lifting up some large flat blocks that snails could pass freely under, and which afforded them a snug shelter, I found large accumulations, many hundreds of shells and living snails. The under surface of these blocks had large and deep indentations, produced by the blended operations of multitudes during many generations.

Prof. Buckland to William Baker.

Oxford, May 29, 1842.

Your last kind and welcome letter arrived as I was starting for London, and demands my best thanks for your successful exertions in the field of Cannington Park, which I shall be tempted to revisit, I hope in your company, the next time I am at Bridgwater. I shall be obliged if you will have the kindness to forward by railroad luggage train to London, on Friday night, the specimens you have kindly collected, * * * addressed to me at Geological Society, Somerset House, London, where I shall be on Wednesday. * * * I want to take the limestones to the meeting of the British Association at Manchester, to continue the discussion of this subject, which began at Plymouth last year, and you will oblige me by allowing me to lay before the meeting your last letter to me upon this subject. With respect to the size of the stones,—the larger they are the better, and I am especially desirous to have the evidences you mention of the different effect of weathering and snail drilling. Also I shall value a slab having its under surface marked with indentations from the complex action of multitudes during many generations.

William Baker to Prof. Buckland.

Bridgwater, May 31, 1842.

I have sent off by this evening's train, addressed as requested in your favour of the 29th, two baskets of specimens; one containing red sandstone, the other perforated limestone from Cannington Park. * * * I did not bring from the hill one of the slabs having extensive indentations on the under surface, but will procure one in two or three days, which shall be forwarded to you at your request. You will see on the large perforated specimen that many of the snail-holes in the upper part have been worn into by the action of the atmosphere.

Prof. Buckland to William Baker.

Oxford, June 10, [1842].

Pray accept my best thanks for your baskets, which arrived last Wednesday at the Geological Society, London. Your snails are capital workmen, and their boring apparatus is the acid that you may detect in their slime by making a snail travel over paper tinted by lithmus.

Prof. Buckland to William Baker.

Oxford, July 24, [1842].

You will duly appreciate the bearing of the enclosed [letter of John Edward Gray to Professor Buckland, as follows], upon the question of holes corroded by garden snails. Please to return it to me. If you will gather a snail dry from a tree, and set it crawling on paper coloured by lithmus, the purple is instantly turned red; the acid is in small quantity, but that is my case.

John Edward Gray to Prof. Buckland.

Ilfracombe, July 22, 1842.

Dear Buckland,—When you read your paper on the holes in the limestone, I said there was no reason why the holes might not have been made by Mollusca, but that I had never seen holes of the kind so made by them. Since I have been here I have seen several parts of the rock in the sea with very irregular holes, and some of them, as in your case, communicating with each other or pierced through the thickness of the stone. This morning I was so fortunate as to be able to determine that they are made by limpets, Patella vulgata. The larger holes seem to have been made by large specimens, or those that had grown to their full size, and the other cavities which have irregularities in their form are pierced by smaller specimens settling themselves on the holes after they have been left empty. In some holes I found five or six or more young ones, each forming a hole for itself on the surface and the cavities of the larger ones. The limestone here, or certain parts of it, appears to be very much affected by these animals, for it is not uncommon to find a limpet not half an inch long having formed a hole more than its height in depth, and the animal, I should think, could not be more than a few weeks old. I have several specimens, but none small enough to send by post. The holes are not so large as those you found. In some places the rocks are quite honey-combed with them. They are generally across, or on the broad side of the laminæ of the strata, but sometimes they are made on the edge.—Yours, &c., J. E. Gray.

William Baker to Prof. Buckland.

Bridgwater, July 25, 1842.

Accept my best thanks for the sight of Mr. Gray's interesting note [as above] on the action of the Patella on the rocks near Ilfracombe.

The lias is similarly worn by these Mollusca, and I believe by Nerita and Turbo littoreus, on the shore at Blue Anchor and Watchet. I observed a short time ago, in the Botanical Gardens and Victoria Park at Bath, a great quantity of grotesque freestone thrown up in heaps, as artificial rock-work. These stones were very extensively hollowed and perforated, apparently by the weather; besides, they had numerous smaller indentations and holes, like those in the Cannington stone. I afterwards saw an abundance of specimens in the same state on the oolite hills about Bath, loose on the surface or partly buried in the ground.

Prof. Buckland to William Baker.

Oxford, August 1, 1842.

By the enclosed [letter of John Edward Gray as follows], which please to return to me, you will see that the evidence is all right. Did you ever notice how the Pholades make their holes? I believe the P. dactylus works by rasping with the tubercles of its shell.

John Edward Gray to Prof. Buckland.

Ilfracombe, July 29, 1842.

My Dear Buckland,—I went on the beach this morning, and caught a gentleman, *alias* a Patella, making a hole. I put him in the lithmus paper, and the whole surface of the foot appears to be equally acid, and strongly so, for the paper became instantly bright red, as you will see by the specimen enclosed. Roget, who is here, was quite astonished at the instantaneousness of the change. We will try the nature of the acid and its strength. The place where the surface of the paper is corroded is where the foot first touched it.— Yours ever truly, J. E. GRAY.

William Baker to Prof. Buckland.

Bridgwater, August 2, 1842.

I return, with many thanks, Mr. Gray's letter and its contents,—the lithmus paper. These have set me at work testing the secretions of other snails than hortensis, and I promise myself the pleasure of writing to you soon on this subject, and on the boring of the Pholades.

William Baker to Prof. Buckland.

Bridgwater, August 5, 1842.

I wrote a note to Mr. Anstice this morning, giving him some account of the late discoveries relative to the excavating power of the garden snail, Patella, &c., and asked him if he did not think that the discovery of the acid in these Mollusca would give us reason to believe that the

Pholades make holes for their habitations in rocks by some solvent fluid, and not by rasping with the tubercles of their shells; and our dear friend's note in reply is so interesting, and shows so much clearness and vigour of mind at this his late period of life, that I think you will be pleased with it; I therefore enclose it with this. I have never had an opportunity of observing how the Pholades make their holes. Have we now any reason to suppose that the tubercles of the Pholas shell are used for rasping, when we find that the smooth-shelled Helix and the Patella can make their habitation in rocks with their solvent acid only? I think we have not. I enclose some lithmus paper acted on by Helix hortensis and nemoralis, which are your aspersa and wood snail, also Limax cinereus. The green stains are produced by the froth or slime of hortensis, procured by irritating the animal with a feather. I am somewhat surprised to find the different secretions.

Robert Anstice to William Baker.

August 5, 1842.

My Dear Mr. Baker,—I never doubted that the animals of most sea shells had the power of dissolving calcareous bodies, by means of some acid which would not act injuriously on their living structure till the powers of life had escaped. Without such a provision how can we account for the powers of many, if not all, of those Testacea in removing the varices and spines, which would otherwise stand in the way of the periodical enlargement of their dwelling; and that the limpet has a like power to make himself a sunken and therefore more fixed dwelling in the rock is, I think, certain. This acid being found also in the land snails goes far to convince me that your opinion concerning their hybernacula-making is correct. Respecting the boring of the Pholades, I recollect it has been the subject of our discussion often, and believe we agreed in opinion that their operations were the effect of the joint action of an acid and the finishing off with their rasp-like shells. The only apparent difficulty in comprehending this to be so, arises from the action of the acid not seeming to act on the shell itself, and that the rock being harder than the shell, that that also should not act injuriously upon it; but I think both these may be solved as difficulties, by considering that the acid may be so applied to the rock as to be withheld from the shell till it became neutralised and inoperative before the animal began its turnings and raspings; and any wearing it must be easy for the animal to repair, endowed as it is with the power of making the shell itself. I would gladly enlarge, but am not up to it to-day. I hope we may yet talk it over. You will allow for my scrambling writing after what I have said, I well know. When you write Dr. Buckland, have the goodness to mention my most affectionate and respectful remembrances to him.—Believe me, my dear sir, yours most sincerely, Robert Anstice.

On the 16th of May last I went to Cannington Park, near Bridgwater, with the object of examining the rocks and large stones at the top of the hill, the late William Baker having observed, more than twenty years ago, that many of them were perforated with holes which he believed to be the work of the common large snail, Helix aspersa.

I found that many of the rocks which protrude above the surface of the ground are perforated with holes or scooped with little hollows, both on the flat or more or less inclined upper surfaces and in the sides, but I did not find any in the under surface of such of the large stones as I was able to overturn, though many of them were somewhat hollowed and indented underneath, and had the appearance of being eroded by some means. Under some of these stones there were living snails and many old snail-shells, and there were a few of each in the holes in the protruded rocks. For the greater part they were Helix aspersa, but there were a few of H. hortensis.

William Baker must have found holes different from those which I have been able to find, for he speaks in his correspondence with Professor Buckland of "marks of very recent operations of the snails," and I well remember, from our conversations at the time, that he was strongly of opinion that the perforations are the work of the snails. He also speaks of "weather-worn indentations and holes distinct from those made by snails," and he adds, "The effects of the weather are seen on the upper surface and sides of the stones; and the operations of the snails are from the sides and under parts, commencing near the surface of the ground." William Baker was a naturalist who did not hastily adopt a theory; he carefully examined the facts before he formed an opinion: but were it not for his observations and opinions, my impression, from what I observed this morning, I believe would be that all these perforations are the work of a marine mollusk at the time when the rocks formed the bed or the border of the sea, and that the snails have merely taken possession of them for their homes.

Thomas Clark.

Halesleigh, May 13, 1864.

The Boring Snail of the Bois des Roches, &c.—In an article in the 'Zoologist' (Zool. 9012), on the "Boring Snail of the Bois des Roches," the accuracy of statements made by the late Dr. Buckland and by Mr. Jeffreys is called in question. I should be very unwilling to doubt such authorities; and I cannot think that so accurate and painstaking a conchologist as Mr. Jeffreys would publish anything "relying on the statement of [even] Dr. Buckland," without quoting his authority, unless he was himself cognisant of the fact. There seems no doubt about the "boring faculty" of the Helix hortensis: may not the Helix aspersa and other snails possess the same? I remember, when I was a boy, noticing a portion of a garden wall, near Limerick, built of the dark gray limestone so common in that locality, which was a favourite haunt of the H. aspersa. The under surfaces of some of the larger stones, where the mortar had partially fallen out, were every year tenanted by these snails, and exhibited a number of circular depressions, varying from one-fourth to three-fourths of an inch in depth, and from half an inch to an inch or more in diameter. I often took snails from these holes, which were, I believe, formed by these animals. I have frequently regretted since that I did not secure one of these perforated stones. It is a curious fact, that although these snails and limestone walls both abounded in this locality, I never found the perforated stones in any other walls. I may not have looked carefully enough, as I was then but a young conchologist, and cared for little more than making a good collection of shells.—*W. Hill Evans; Bradford, Yorkshire, April* 20, 1864.

Do the Larvæ of the Genus Argynnis Hybernate?—I suppose there is no reason to doubt that the British species of Argynnis oviposit during the summer months, and that they do not, like the Vanessas and others, come forth in early spring for that purpose. Now, in what stage are the insects during the winter? are they ova, or larvæ, or pupæ? No entomologist of my acquaintance has ever found these butterflies in any of these states during the autumn or winter months. Yet one can hardly imagine that the ova, laid in August at the latest, remain unhatched till the ensuing year, when the different species of Viola are sufficiently grown to afford them sustenance. A. Paphia, it is said, feeds also on species of Rubus and Urtica. We know, moreover, that our species of Melitæa do hybernate in the larva state. It is to be regretted that, owing to the Diurni being readily taken on the wing, few entomologists devote any attention to their larvæ. It would be well for those who reside in those spots where A. Adippe and A. Aglaia are most abundant to seek out and publish the histories of their larvæ, of which in this country scarcely anything is known.—*John R. S. Clifford; 21, Robert Terrace, Chelsea, June* 14, 1864.

Economy of Sesia tipuliformis.—This insect, which was first, I believe, recognised entomologically from specimens taken in Whitehead's Grove, Chelsea, is still pretty numerous in this locality. The young larvæ enter the smaller twigs of the currant bushes, and proceed downwards towards the stems. I have found no examples of their working a fresh track upward, although they will sometimes pass up and down a mine already formed. When full-grown, which is generally about the middle of May, the larva forms a cocoon of the pith and frass, usually selecting for its resting-place the junction of a branch with the stem, or of a small branch with a larger one. The imago appears in about three weeks. The females fly very little, and the males only during sunshine, neither sex being found far distant from their food-plant. I once, however, captured one resting upon a window about twenty feet from the ground.—*John R. S. Clifford.*

Cells of Bees and Wasps.—I have been very much interested in this controversy of the bees and wasps, &c., cells, whether they are produced by pressure, or whether they are the natural result of instinct (so called) of the insects themselves. Now I must say, from what I have seen of the architecture of these insects, I must defend the theory brought forward by Mr. Smith,—that it is the result of instinct or rather reason, of which the former is only a modification of the latter. I have enclosed a sketch of a small nest, of, probably, Vespa norvegica in my possession: from the size of the cells in this it will be seen that the angularity extends to the outside, and even to the rudimentary cells, showing at once that it is not the result of pressure, for, taking the outside cells as a criterion, where they still have the hexagonal form without the lateral pressure, it argues very strongly against the pressure theory. In this nest the Nos. 1 and 2 appear to have been the first constructed cells, and they are sharply hexangular as near their whole length as it is possible to make them, and No. 1 slightly projects above the level of the other cells; even here it is as angular as when subject to the so-called pressure. Again, where the cells of these insects are built up of small atoms, and added bit by bit as they are—similar, indeed, to masons building a house with bricks—see how the so-called pressure is exerted. I can understand if a mass of plastic cells be placed side by side, and equal force be applied to the mass, that they would be forced into hexagonal cells; but when cells are built up bit by bit, and seem in an unfinished state, others completed,—and these, all of them, on the same almost invariable hexagon,—I think the argument is strongly in favour of the instinct, reason theory.—*Edward Parfitt; June* 2, 1864.

Rose Scent of Cicindela campestris.—At Pembury, about the latter end of May this year, I caught a large specimen of Cicindela campestris which emitted a very strong scent of roses. The insect was kept for several days alive in a bottle, but the odour did not diminish.—*J. Jenner Weir; 6, Haddo Villas, Blackheath, S.E., June* 3, 1864.

Occurrence of the Otter at Kingsbury Reservoir.—On the 20th of May a fine otter was surprised in some long grass near this Reservoir, and was killed by a powerful dog, after a severe struggle. It weighed fourteen pounds, and is now in the hands of a birdstuffer for preservation. An otter has not been seen here for more than fifteen years, and at so short a distance from London may well be considered a rarity.—*J. Edmund Harting; Kingsbury, Middlesex, May* 22, 1864.

[I have learned on the most reliable authority that three other otters have been killed in the same locality. I shall feel much obliged to my readers if they can give any reasonable explanation of the manner in which the otters reach this comparatively isolated water.—*Edward Newman*].

Bonnet of the Whale.—Temminck's 'Fauna Japonica' is the only work in which after diligent search any mention of the whale's bonnet has been found. It is there shown in two figures—lateral and dorsal views—of Balæna australis, the "right" whale of the Pacific, and is represented as a white oval prominence on the upper surface of the nose of the animal. This agrees with the description given of it by the

American whalers, except as regards its colour, which, like the surrounding skin, was black when it was received, exuding oil and covered with whale-lice, fresh from a whaler at the Sandwich Islands. Temminck's description of this curious production is very meagre, and amounts to little more than a statement of its presence on the nose of the particular species of whale. My brother fortunately brought home two specimens of the bonnet, one of them only six inches long, and showing in that early state of development essentially the same characters that mark the larger example. The external appearance of the specimens, especially in the larger one, is that of a clinker, as Mr. Buckland describes it, or perhaps, more strictly speaking, that of a large rough piece of black cork, deeply grooved and channelled, generally in the direction of its long axis, with a rude sort of symmetry, even in these irregularities of its surface. I will forgive Mr. Buckland his joke, although at the expense of the whale's character. I understand that Professor Owen believes this "bonnet" to be only a piece of diseased skin, and says that a similar specimen is in the museum of the Royal College of Surgeons: this specimen, however, cannot be discovered. The bonnet is undoubtedly a portion of the epidermis unusually thickened, and its growth is so far abnormal; but its symmetrical form, and, according to the whalers, the constancy of its presence and position on the animal, point to something more than a state of disease, and incline me to rank it with those unintelligible formations,—the warts on the legs of a horse, or the still more remarkable protuberances on the face of the wart-hog. Three species of whale are hunted in the Pacific, and of these the "right' whale is found the furthest north; the sperm whale has the greatest range southward, and between them is a species known as the "bow-nosed" whale—such is the information given by the Pacific whalers. It must be remembered that the "right" whale of the Pacific—the one on which the bonnet is found—is not the familiar "right" whale of the Greenland seas. I may add that my brother has seen several of these bonnets brought in by the whalers, and some of them three feet in length. Further inquiries are being made about the history of the whale's bonnet, and I hope before long to obtain additional information about the mysterious subject.—*E. W. H. Holdsworth.*—'*Field.*'

The Birds of Walney Island.

By J. Edmund Harting, Esq., F.Z.S.

The island of Walney is situated on the north-west coast of Lancashire, to the west of Low Furness, and is about nine miles long by a mile broad at its greatest breadth. It rises like a wall in the sea, and from this circumstance it appears to have derived its name, being called by the Saxons Waghney, Woney and Walney, or a wall in the water.

Being an island only at high water, when the tide is out, it may be reached on foot from Barrow, from which it is distant about a quarter of a mile. It contains four small hamlets, *viz.* North-end, North Scale, Bigger and South-end, and some portion of the land in the centre of the island is now under the plough.

Being a great lover of Nature, and a great admirer of the habits of birds, it occurred to me that a visit to this island would be productive of much interest, and, as it proved, I was not mistaken. I accordingly started on the 30th of May, taking with me as little luggage as possible, including, however, a box with some tow for eggs, a "Westley Richards," a good glass by Ross, and a note-book.

Landing at the small hamlet of North Scale, I enquired of the ferryman for a person who knew the island well, and who could point out to me the breeding-places of the various birds inhabiting it. By good luck his brother appeared to be the very man I was in search of, and although at first he declared he could not leave his work, a promise of extra wages, and the insinuation that he would probably find my work much more interesting, finally prevailed with him, and he agreed to accompany me. The first fact that I learned from him was that the blackheaded gull and Sandwich tern ("large sea-swallows," as he termed them) were breeding on private ground, and were strictly preserved. Moreover, that the owner was particularly strict, and that there was but little chance of my obtaining leave to take any of the eggs. This was anything but encouraging; however, I resolved to pursue the safest course, and endeavour, if possible, to obtain permission. Leaving my guide at a little distance with my gun and a basket for eggs, I proceeded to the dwelling of the stern proprietor, and stated the object of my visit to the island. At first I met with a decided objection on his part, but on my stating that I had come all the way from London on purpose to ascertain what birds were breeding here and to collect a few of their eggs, he gradually relented, and said he would accompany me himself, and then we would see what might be done.

Not half a mile from the house we came upon the breeding-ground of the blackheaded gull, and while walking there I had leisure to observe the numerous small birds which we disturbed on our way. The linnet and meadow pipit were common, and the wheatear particularly numerous. I also saw a pair of stonechats, but, with the exception of the rock pipit and cuckoo, to be noticed hereafter, these were the only birds of the order Insessores which I observed.

On reaching the ground occupied by the gulls an extraordinary sight presented itself. It seemed as if all the rabbits, wheatears and blackheaded gulls in the county had congregated at this one particular spot, and continuing in perpetual motion, to one unaccustomed to such sights, it was almost bewildering. The rabbits seemed almost regardless of our presence; the wheatears merely retired to a little distance, uttering their peculiar "chat, chat;" and here I may remark that I never observed anywhere wheatears either so large or so finely coloured as those on Walney. The blackheaded gulls kept hovering over the spot where their nests were placed, rising and falling like monster snowflakes, till the eye became dazzled by looking at them. The nests were placed on the ground, within a few feet of one another, and for the most part built in tussocks of coarse grass. The material was invariably dry grass only, and every nest contained either eggs or young birds, while in some cases I noticed both. As a rule, the majority of nests contained three eggs each, but many of them had four, and in a few instances I saw three eggs (cracked) and a young bird. Several of the young birds, two or three days old, were running about or hiding in the coarse herbage, while overhead, I may say without exaggeration, hundreds of the parent birds were dashing about on outstretched wings, uttering their wild screams, which were almost deafening. Examining every nest, I proceeded to pick out the handsomest eggs, until I had collected about a score.

We then left the gulls in quiet possession, and proceeded to the eyrie of the Sandwich terns. Long before we reached the spot, we could point to the exact situation of the nests, for the birds were continually hovering above and around them. As we approached they rose perpendicularly to a great height, keeping up a succession of harsh screams, not unlike the sound produced by running a sharp stick across a comb. The nests in structure were very similar to those of the blackheaded gulls, being composed entirely of grass, and placed quite close to each other on the ground, the only difference being that the gulls' nests were placed on somewhat level ground, whereas those of the Sandwich tern were situate on the side of a sand-hill among long thin grass. Standing still for a few minutes I counted seventeen nests, all close to each other, all containing eggs, and the majority having three. They had been robbed once, much to the annoyance of the owner of the land, and he was therefore very loth to allow any more eggs to be taken. As a particular favour, however, I was allowed to select three of the handsomest from different nests, and these I carefully placed in the basket, consoling myself with the thought of the old adage that "half a loaf is better than no bread." The proprietor then left us, after exacting a promise that we would not shoot anywhere in the vicinity of his nests. This I readily agreed to, and we proceeded on our way.

Along the north and west coasts of the island runs a long line of sand-hills, about fifty yards above high-water mark, perforated in many places with rabbit-holes, in some of which, as I learned from my guide, the shieldrake breeds every year. This was interesting intelligence, and I had some hopes of obtaining not only a few of their eggs but also a pair of the birds themselves.

In the centre of the island, upon that portion which is not cultivated, we walked over a beautiful carpet of flowers. The burnet-rose (*Rosa spinosissima*), the crimson cranesbill (*Geranium sanguineum*), and a beautiful little pansy (*Viola tricolor*) were growing close together in profusion, and were all in full bloom, and while the eye was delighted with the colours, white, crimson and blue, a delicious smell came from the flowers of the rose.

Instead of walking abruptly over the sand-hills, I went down on my hands and knees and crept cautiously to the top, regardless of the noisy cry of a pair of oystercatchers that kept flying round me in large circles, and convincing me by their manner that they must have a nest at hand. On peering through the long grass which covered the hill-top, what a pleasing sight met my view! The tide running out, and a score of shieldrakes, male and female, feeding below high-water mark, about four hundred yards distant. They were easily recognized by their bright colours and by their walk, which is more like the firm step of a goose than the waddle of a duck, and appeared to be feeding on the cockles and small shell-fish left by the receding tide. Oh! if I could only crawl within range of them. But the thing is impossible. Long before I could reach them, they would see me, and be off. The only plan, therefore, is for my guide to try and drive them to me. Accordingly he started off, keeping behind the sand-hills, and endeavouring to get to a spot from whence he might run down to the beach and put the birds up between us, in the hope of driving them over me, as I lay concealed in the grass. Two or three times, as a single pair rose from the scattered flock, and came flying inland at a great height, I fancied they were coming towards me; but, as if sensible of a hidden danger, they wheeled again and disappeared round the abrupt sand-hills. Before my guide could reach the spot he intended, the whole flock had risen and disappeared, without having afforded me a single shot. Several times subsequently did I endeavour to get within range of these wary birds, but they were so shy that I found it impossible to reach them even with cartridge. The only other method I knew of to obtain a pair was by trapping, and by this means, I am almost ashamed to add, I subsequently obtained a very handsome pair. Although we explored several burrows, we were not lucky enough to discover any nests of this species; but I afterwards purchased an egg which had been taken by a boy from a burrow the previous day, and was still unblown.

Crossing the sand-hills at the North-end, and proceeding along the west coast, I began carefully to search the shingle above high-water mark for eggs of the oystercatcher, ringed plover and terns, although as yet I was uncertain what species of the last-named I should find breeding there. The sloping beach was of fine sand, thickly sprinkled over, above high-water mark, with rough gray stones and scattered shells (Cardium rusticum, C. edule and Buccinium undatum), affording by its colour a tempting nesting-place to the waders and terns.

Opposite to North-end and across the water rose the Cumberland mountains, Blackcombe and Coniston ("Coniston Old Man," as the latter is called), the tops covered with snow, although it was the last day of May; while to the left, and the left of that again, we could see the Isle of Man and the Welch mountains.

Two hundred yards off, at the edge of the water, were four oystercatchers, or "Sea-pies," as they are called, and near them a little flock of ringed plovers were feeding. Many times have I tried to stalk these oystercatchers, crawling along the ground for a considerable distance to try and get within range, but without success. They are such wary birds that, unless some boulders of rock or stone intervene as a screen, it is almost impossible to approach them. No one who has not tried it knows the luxury of standing upright, after crawling horizontally along the ground for two or three hundred yards, and I have more than once been glad to lie flat on my back on the sand to rest after this tiring work. A peculiarity which I have remarked with regard to both oystercatchers and ringed plovers when in flocks is this, that whenever I disturbed them, so as to cause them to fly down wind, they invariably turned again before alighting, so as to pitch with their heads to windward, and the reason of this would appear to be that in the event of their alighting when going down wind, if the breeze were strong, they would probably be carried over the edge into the water.

Blackheaded gulls and terns were constantly passing over our heads as we advanced, several of the latter carrying small fish in their bills, and I was delighted to see, besides the common and Sandwich terns, several of the lesser species amongst them: they were easily distinguished when flying in company with other terns by their size and by their cry, which is a single sharp note frequently repeated.

We had not proceeded far along the shore before I almost trod upon four eggs of the oystercatcher, which were placed in a slight hollow scooped in the sand, and without any appearance of a nest. So closely did the eggs resemble the stones which surrounded them that it was difficult to see them at any distance. While stooping down to pick up the eggs, the note of a curlew attracted my attention, and turning round I was just in time to see one of these birds crossing the water and heading for Cumberland. It would be on the mountain-side no doubt that this bird had its nest, and not upon the sandy isle of Walney, where it would only resort for food, and find plenty of mollusks and sand-eels. A second curlew soon after appeared and followed the direction of the first. These were the only two which I observed.

In a little bay, as it were, of sand, between two sand-hills, and well sheltered from the wind, I found four eggs of the ringed plover. As in the case of the oystercatcher, there was no nest, the eggs being placed, with the small ends together, in a hollow scooped in the sand: this I attributed to situation and want of materials, for I believe it is usual with this species to make a nest of small pebbles. I have found many nests of this bird on the Sussex coast, and observed in every case, without exception, that they were concavely paved with very small pebbles, which, being placed with their flat sides uppermost, looked like little bits of tessellated pavement.

It was only in the case of the gulls and terns that we actually disturbed the birds from their nests. The oystercatchers and ringed plovers we never found near their eggs; they had probably taken the alarm quicker, and gone away before we perceived them.

I looked in vain for turnstones and sanderlings, although I had found the latter a day or two before, in pairs, on the coast at Warton, and shot three of them. No sandpipers of any sort could we find; in fact, Charadrius hiaticula was the only small wader we saw on the island: this bird appeared tolerably common, and we afterwards found several more of their nests; although they had paired they seemed to congregate at feeding time, for we saw several little flocks of them on the sands when the tide was out.

I was very anxious to ascertain whether the lesser tern was breeding on the island. I had seen five or six of the birds, and after a long search I was fortunate enough to find three nests, the first containing four and the second and third three eggs each. These nests—if nests they can be called, being merely slight hollows in the sand—were not placed close together, as in the case of the Sandwich tern, but were at a considerable distance apart. The eggs, which were all very similar, were of a pale sea-green colour, with small black blotches and spots: after they were blown the delicate green tint faded entirely, and they are now of a pale stone-colour. A peculiarity which I noticed with regard to the breeding of the lesser tern was this: the only eggs which I found of this species were all of them laid on the beach *outside* the sand-hills, in view of the sea, and not in the interior of the island. With the common and arctic terns it was just the reverse; I found about a score of nests of the common tern and four of the arctic tern, and in no instance did I find them *outside* the sand-hills; they were invariably on the *inside*, where it was more sheltered from the wind, and from whence the sea could not be seen.

As far as my experience goes, neither of the two last-mentioned birds make any nest, the eggs being laid on the bare ground, and, owing to the great similarity between the birds and eggs of both species, it requires some care to distinguish them. The arctic tern, however, is slightly larger, and has the tarsus shorter and the tail longer in proportion; the bill is also shorter, and not tipped with black, but red throughout, while the under parts, which in the common tern are pure white, in the arctic tern are pale gray. The eggs of the common tern are generally very round, and are more profusely marked; while those of the arctic tern, as a rule, are more pointed at the smaller end, of a lighter ground-colour and have fewer markings. As I have stated, I found four nests of the last named tern, and in three instances bagged one of the old birds, thus making certain of the species. The common tern on the coast of Lancashire is called "sparling," and when I first heard my guide exclaim, "Here are some sparling's eggs," I was fairly puzzled to know what eggs they could be. I have since found mention of a bird, in Dr. Leigh's 'Natural History of Lancashire,' called the "sparling fisher," but the description given of it is so vague that I cannot guess what bird it may be. The author says, "It is about the bigness of a duck, and by a wonderful activity in diving catches its prey, and yields a very pleasant diversion when pursued by water-dogs."

The terns are very pugnacious in attacking other birds that approach their nests. I saw a lesser tern actually attack a herring gull, following it for a long way, and every now and then making a swoop and endeavouring to strike it with its bill. The gull, like a great coward, made no attempt at resistance, but only tried to avoid its attacks by flight, now and then uttering a short angry bark. I also saw a crow pursued by a common tern, and very much harassed he seemed to be, and glad to make his escape.

I have mentioned the herring gull, but although I saw a pair of these birds on the island, this species does not breed there, the blackheaded gull being the only gull to be found breeding. I discovered another nesting-place of the last-named species, apart from that which is preserved, and collected a few more varieties of the eggs, while the man I had with me took between thirty and forty of the common type to carry home for consumption, considering them much superior to hen's eggs. The variety which exists in eggs of the blackheaded gull is very curious, and perhaps there are no other eggs which differ so much, except those of the common guillemot. I may mention a few of the most marked varieties which I have taken. Common type, olive-brown, with dark spots and blotches. *Var.* 1. Green, with dark spots or blotches. *Var.* 2. Light gray, with olive blotches. *Var.* 3. Pale sea-green, with a zone of spots at larger end. *Var.* 4. Pale bluish white, with scarcely any markings at all.

The blackheaded gull, as well as some of the terns, used formerly to breed at the south end of the island, but they were so frequently disturbed by having their nests robbed, that they forsook that part entirely, and my guide assured me it would now be useless to explore there. Accordingly we continued our walk along the west coast, now inside the sand-hills, now on the outside, according as we were attracted by the note or sight of some bird we were in quest of. Crossing the foot of a sand-hill where the long grass was growing rather more thickly, a rock pipit rose within a few yards of us, and after a little search we found the nest, containing four eggs, which I took. I subsequently found that they contained young birds, and in consequence had some trouble to blow them: they were of the usual size and colour, scarcely differing from some that I had taken the previous May on the Fern Islands. While stooping to pack them up a tern came towards me, flying at no great height, and as it approached, I felt certain, from the beautiful pink tint of the under parts, that it was a roseate tern. I seized my gun and stood up, but, quick as thought, the bird, seeing my movement, rose perpendicularly in the air. As it hovered for an instant, I pulled the left barrel, which held a cartridge, and thought the bird would fall: it dropped its head, shook it, and seemed to stagger a little, but recovering itself flew on, and was crossing the water, when suddenly I saw it tumble headlong into the sea. To reach it was impossible, as the waves were carrying it away, and so I could only walk on in the hope that I might see another and be more successful. But although I subsequently saw and shot at three more birds, which I believe were roseate terns, I did not kill any of them. I had read that this species was to be found on Foulney Island, nearly two miles distant from the south-eastern extremity of Walney, and therefore I thought it not impossible that a few pairs might be found on Walney, and perhaps breeding there. Never having taken a nest of the roseate tern myself, and only knowing the egg from specimens in the collections of different friends, and a single egg in my own collection from the Fern Isles, I was uncertain in what situation to look for the nest, and moreover was ignorant whether the roseate made a nest like the Sandwich tern, or simply laid the eggs on the bare ground, like the common and arctic terns. However, not far from the spot where I had seen, as I believe, three roseate terns, I found a nest, evidently that of a tern, from the eggs, but so different from any that I had hitherto found, that I exclaimed at once, "This must be a roseate tern's."

The Sandwich tern, as I have before observed, makes a nest of dry grass; the common and arctic terns lay in a hollow on the sand (in no instance did I find any deviation from this); but the nest in question was composed of sticks, little pieces of drift-wood and dry straws, and contained two eggs, which, as regards shape and colour, certainly resembled the eggs which I have seen of the roseate tern. No bird was near the nest, and therefore, failing to identify the eggs by this means, I am anxious to ascertain, *first*, whether the common and arctic terns *invariably* lay on the ground *without* any nest, and, *secondly*, whether the roseate tern makes a nest such as I have described. I shall be obliged by the experience of any other correspondent. In the event of these two queries being answered in the affirmative, and having seen roseate terns on the island, I think I may safely conclude that the nest belonged to a pair of these birds.

To mention all the eggs I took would in many cases be a repetition. Suffice it to say that as we proceeded we continued to find eggs of the oystercatcher, ringed plover and common tern; and I may observe that in one instance only did I find any deviation from the rule that these three species lay in the hollow of the bare ground: this was in the case of an oystercatcher, where I found a very pretty nest formed of shells, most of them broken, and evidently collected from a distance, as there were no other shells anywhere near the nest.

On the cultivated portions of the island I noticed several peewits, but found no eggs. Indeed I did not care to lose time by searching for them, as I find plenty every year at home.

I was rather surprised to hear a cuckoo on the sand-hills: I suppose it had flown there to drop an egg in the nest of a meadow or rock pipit, both of which birds are common there, particularly the former. A few days before I had seen a pair of cuckoos on the coast at Lytham, and they also were on the sand-hills. On seeing one of them alight upon the ground, I at once mistook it for a sparrowhawk; and I can only account for the cuckoo being found in a situation so unusual and so unproductive of its ordinary food by supposing that it had flown there merely for the purpose of laying.

My guide informed me that landrails were frequently met with on the island, but we did not see or hear any. I also learned that dunlins, knots and turnstones were very common there in winter, but not seen at any other time of the year.

Preceeding along the west coast, before reaching South-end we turned to the left, crossed the interior of the island and followed the line of east coast until reaching North Scale, from whence we had started. Here I recrossed to the mainland, but this time on foot. The tide being out, and the water at most only knee-deep upon firm sand, I preferred to wade rather than wait till the water was deep enough to launch a boat. So, leaving my guide at his cottage at North Scale, I returned, laden with my treasures, to Barrow, after one of the most interesting rambles I have ever made.

J. Edmund Harting.

List of, and Remarks on, some of the Birds observed during a Year's Residence on the North-East Coast of Scotland, 1858-59. By Captain Henry Hadfield.

Gannet.—On entering the Clyde, the 13th of June, 1858, on my return from North America, I passed the Ailsa Rock, one of the most celebrated breeding-stations of the gannet, but at too late an hour to observe the birds. A few only had been seen during the day, but it being the season of incubation they may not wander far from the coast.

Brownheaded Gull.—June 17. In coming up the Caledonian Canal, the steamer was closely followed by a numerous flock of these interesting birds, seemingly conscious of being a privileged class, as they occasionally, in the most fearless manner, alighted within a few yards of the stern, narrowly inspecting the broken water: their power of vision is almost incredible, for on throwing overboard some small fragments of bread they were instantly descried amid the foam and pounced on, and that too with unerring aim. I then tried them with minute particles of bread, the merest crumbs, but they were secured with equal facility, where no human eye could have seen an object ten times the size.

Swift.—June 18. Observed swifts hawking over the town of Elgin till a very late hour, and it was 10 P. M. ere they had all retired to their roosting quarters in the ruined tower of its ancient cathedral.

Dunlin Sandpiper.—June 18. Found the nest of this common species on the banks of the Lossie. The ground had been slightly hollowed and lined with coarse grass; and the nest, which was but a foot or two above the bed of the river, imperfectly concealed by a stunted furze-bush. The four large eggs, pointing inwards and inclining downwards, well nigh filled the nest; on one being broken by my dog it was found to contain a chick in an advanced stage. The birds hovered about, occasionally coming within a few yards of me, and one of them perched on a railing, but for a few seconds only, emitting a plaintive cry.

Blackbird.—June 21. The song of one was heard at 10 P. M.

Willow Wren.—June 24. A young bird was observed.

Nightjar. — June 26. When walking through a wood in the vicinity of Elgin, a nightjar suddenly appeared on the path before us, tumbling about in the most extraordinary manner, and flapping the ground with its wings. As we advanced it gradually retired, half running, half flying, and though pursued by my sons with their spaniel for some distance, did not quit the path, but kept fluttering on in front of them in the most tantalizing way, occasionally taking a summersault, till it had drawn them away from the nest, which doubtless was concealed among the fern by the road-side; it then disappeared.

Tawny Owl.—June 26. An owl of this species, I believe, was found sitting on the branch of an oak: my attention was directed to it by the alarm-note of some chaffinches.

Creeper.—June 26. Saw a few birds of this species.

Redstart.—June 26. Observed an old bird with three or four young ones, which it was endeavouring to keep out of harm's way.

Whinchat.—June 28. Found a nest with six young birds, but one had been crushed to death. The nest was placed in the forked branch of a furze-bush, but so low as to be concealed by the long grass: it is composed of coarse grass, and has a lining of wool and hair. Two young whinchats, subsequently taken, captured flies readily enough; they survived only a few hours.

Sand Martin.—June. This species is very abundant, breeding in the pits and banks of this sabulous district.

Turtle Dove.—July. Two were observed on the wing.

Wood Pigeon.—July. Very numerous.

Pied Wagtail.—July 13. A young male, nearly full grown, was shot.

Lapwing.—July. Towards the middle of the month a young female lapwing of nearly adult size was shot.

Wheatear.—July. Occasionally observed.

Whitethroat.—July 1. A pair of whitethroats, accompanied by their young, were seen to-day.

Rock Dove.—July 29. Inspected the Cowee Caves, in the cliffs of the Moray Firth, about seven miles from Elgin. Looked into several without finding the pigeon, but at last had the satisfaction of seeing a pair dart out of one of the largest caves, the sandy floor of which was impressed with innumerable foot-marks, and strewn with their feathers and a few egg-shells. But few holes or shelving rocks where their nests could be placed were observed, so doubtless they build in the clefts of the cliffs higher up. Though I got more than one shot I failed in procuring a specimen. No one who has not tried it can conceive the difficulty there is in shooting them, there being frequently two or more openings to the caves, so that one cannot foresee through which they may chance to escape. Their exit, too, is often as sudden as unexpected; so that they may pass within a few feet of one's head without being seen, and rising abruptly disappear over the edge of the cliffs, which are here of no great elevation. Their appearance, too, is as sudden as their departure; a whirring sound is heard, but they have reached the sheltering cave unobserved. Amid these chaotic and gigantic rocks they appear so dwarfed in size that one can hardly recognise them. After reascending the cliffs a small flock was observed, in which there were a few of varied plumage, evidently of mixed breed. On revisiting the caves on another occasion a wounded pigeon escaped by concealing itself among the rocks, but was found two days after on the sea-shore: it being unable to fly, I was greatly astonished to find the crop full of charlock-seed, and could only account for it by supposing that it had been sought for and fed by its partner: it was an old bird.

Ringed Plover.—July 31. Found a large flock on the sands near Lossiemouth, but I only managed to kill a couple, both birds of the season. They have the base of the lower mandible slightly tinged with orange, but there is little appearance of a black band on the forehead.

Sanderling.—August 17. Shot a bird of this species. On the 28th three more were procured.

Wild Duck.—July. On visiting the ruined Castle at Loch Spynie, young ducks were to be seen skulking and hiding among the long grass. Some caught for inspection were nearly full grown, and on being released flew into the loch. Later in the year a drake was shot on the coast, measuring 37½ inches in extent of wings.

Golden Plover.—October 22. Found a large flock on the sea-shore; secured four. When the hills are covered with snow vast numbers of plovers are to be seen on the sands at low water probing for worms. I found them unsuspicious at first, but after being fired at they could only be approached under cover of the grass-covered sand-hillocks.

Turnstone.—October 25. Shot a bird of this species, the only one observed.

Shore Pipit.—November 6. Shot one of these pipits, which appears scarce on this coast.

Purple Sandpiper.—November 11. Found a flock of about thirty sitting in the hollow of a rock on the sea-shore. Allowing a near approach, three of their number were readily killed.

Oystercatcher.—November 13. Shot one of these common birds.

Rook.—November 14. Seeing a number of rooks flying in and out of a plantation of Scotch fir, I was induced to watch them closely: I then perceived that on emerging from the wood they held something in their beaks, but what it might be I could not even conjecture, so I endeavoured by a close inspection to find out, but the thickness of the foliage prevented my doing so; however, I observed that as soon as they had secured the object of their search they alighted with it on an open space, and immediately commenced striking and tearing it with their bills: this operation over, and it was not prolonged above a minute or two, they forthwith returned to the wood for a fresh supply. As I had, after a diligent search, failed in finding out on what they were feeding, it occurred to me that possibly the fir-apples strewn over the ground might have been brought there by the rooks, so a few were picked up and examined; they were in different stages of decay, and in some a white grub or maggot was found, on which they were doubtless feeding.

Common Bunting.—November 29. A bird of this species was observed, the first I had noticed.

Brownheaded Gull.— November. This and other gulls are to be seen daily in vast numbers frequenting the newly-ploughed lands, hovering over the plough, regardless of the reiterated cries of the ploughman, and settling down in the furrows to pick up the worms and grubs: on reaching the end they momentarily disperse before resuming their search. The lapwings, though more numerous, are constantly chased by the gulls, but their irregular, jerking, tumbling flight secures them from prolonged pursuit.

Redbreasted Merganser.—December. Shot one on the Frith.

Garganey Teal.—December 14. Found a small flock of garganeys a mile or so from the harbour: they allowed us to row within fifty or sixty yards of them without taking wing, so I felt confident of securing some. Taking deliberate aim at a splendid old male I fired, but ere the shot reached him they all dived, rising again at a considerable distance, and flying out to sea. Though I endeavoured to get a second shot I did not succeed. On an isolated rock, some distance out at sea, I saw an innumerable flock of sandpipers reposing about mid-day.

Black Scoter.—December. Small flocks were frequently seen feeding near the surf, but generally out of gun-shot.

Longtailed Duck.—January 5, 1859. On rowing a mile up the Frith, I fell in with a few of these elegant ducks, but their flight is peculiar, the tail being so depressed. I found them shy and difficult of approach, though feeding just outside the breakers. On being fired at they took a long flight, and I was struck with their peculiar but melodious note, so like to what one imagines the Æolian harp to be: I could hardly divest myself of the idea of its being the sound of music borne on the breeze.

Cormorants.—January. Many birds of this common species are to be seen. When disturbed or shot at, they retreat to the Beacon Rock, where they are unapproachable. A numerous colony has been established—probably for ages, the rocks being greatly stained and blanched—on the ledges of the lofty and precipitous cliffs to the westward of the caves. The cormorants may here be seen by scores standing in rows, in their usual stiff sedate manner, but when alarmed stretching out their necks in an awkward way to peer at the intruder beneath, before dropping off and flying out to sea. If a specimen be required, the surest way of obtaining it is by making a *détour*, and appearing suddenly on the edge of the cliff. However, on their return of an evening, full fed, they are not so vigilant, or they cannot discern an object directly opposed to them. This is observable in some animals—the hare, for instance: one that I started ran towards a man ploughing a field, nor did it deviate from the direct course till it must have heard the trampling of the horses; it then bounded off at a right angle.

Gannet.—Have occasionally observed them fishing in the Frith, but at a considerable distance from the shore. They descend on their prey with amazing velocity, sending the spray many feet into the air: they often turn sharp round before taking the plunge; in doing this the body is distorted, but their general movements are light and buoyant.

Song Thrush.—January 13. Heard the song of a thrush, but the notes were not prolonged.

Redwing.—January 13. Saw a bird of this species.

Cole Tit.—January 13. Several were observed.

Goldencrested Regulus.—January 13. A few were seen.

Missel Thrush.—January 13. Observed a pair in the garden cowering on the ground at the foot of a tree to shelter themselves from the tempest. Unlike a "storm cock" this!

Black Guillemot.—January 15. Shot a bird of this species on the Frith.

Razorbilled Auk.—January. Frequently observed.

Snow Bunting.—January 22. First observed the snow bunting near Burghead on a barren and uncultivated tract of land, thickly dotted with furze, and skirted towards the beach by sand-hillocks covered with sea-grass (*Zostera marina*). They were in small straggling flocks, but easy of approach, and when fired at would often realight at no great distance, so I had no difficulty in procuring specimens; one, a splendid old male, so white as to have been quite remarkable. A dark grub was found in the gullet of one, and a few grains of corn and pieces of quartz in the stomach. On other occasions flocks were seen feeding on the shore, running among the sea-weed, but keeping close to the sand-mounds, which they occasionally traversed, though seldom diverging from the coast line.

Sky Lark.—February 20. First heard the song of the sky lark: the day was bright, and the thermometer had risen to 50°.

Rooks.—February 27. Though there was not one to be seen among the lofty trees of the rookery at Gordonstone, I observed hundreds in a field of newly-sprouted corn, so busily engaged, too, that my approach was seemingly unnoticed. I now remarked that they walked and fed in pairs, and could distinguish the sexes; besides when flushed they generally rose and flew in pairs, alighting in the same order. I disturbed them again and again, but always with the same result, except here and there a straggler. March 6. Found the rooks very clamorous, so that they were heard long before they were seen. The cawing proceeded from a grove of Scotch firs with bare and massive trunks, but crowned with a profusion of lateral branches, on which the nests are placed. My arrival was no sooner announced than there was a general rising of the whole colony, with a deafening clamour; but ere long they were dropping singly or in pairs among the branches, in their usual awkward manner, but none did I observe on the nests, though one was seen carrying sticks. All seemed bustle and confusion, without any perceptible result, though they may have been choosing a new site or asserting their claim to an old one: I saw but one fight, and that not *à l'outrance*. On the 10th of March I had another look at the rookery; some of the nests were well nigh completed, but I saw no rooks on them during the half-hour that I remained on the spot, though they continued flying round and about the trees. One with building materials, on seeing me, alighted in a ploughed field.

Yellow Bunting.—February 27. A bird of this species was observed to have commenced building.

Wigeon.—March 4. Some were observed on Loch Spynie.

Teal.—March 4. A few teal were observed on the Loch.

Egyptian Goose.—March 4. Some very large water-fowl were seen; their black and white plumage led me to believe they belong to this species.

Curlew.—March. Several were seen about the Loch.

Heron.—March. A large heron was observed standing knee-deep in the water of the Loch, perfectly motionless, with rigidly outstretched neck and head, intently watching its finny prey; but its patience must have been sorely tried, for during the half-hour or so that I watched it through a glass it neither struck at fish or frog, and moved its head but once as if about to dart, but the motion was so slight and sudden as to be hardly perceptible. But for the glass the heron might have been mistaken for a stranded log, so inanimate did it appear. The fish doubtless are deceived too.

Gray Plover.—March 8. A few were observed, also lapwings; but the latter have been seen, though in no great numbers, throughout the winter.

Wood Pigeon.—March 10. Observed a flock, numbering some hundreds, rise from a turnip-field.

Blackthroated Diver.—March 17. An immature bird of this species, shot at Speymouth, was brought to me for sale, but being much injured it was not purchased.

Bernacle Goose.—March 28. A handsome old bird, but slightly wounded, was shown me.

Wren.—March 29. One was observed, with its beak crammed with dry grass.

Wheatear.—April 6. Saw two wheatears.

Greenfinch.—April 17. Still gregarious. The weather has been cold of late, but to-day the thermometer has risen to 44°.

Reed Bunting.—April. When walking from Elgin to visit the ruins of Pluscarden Abbey, numbers of these birds were observed among the alders on the banks of a rivulet flowing through this beautiful valley. They were constantly flitting on before me till by degrees a considerable flock had collected.

Thrush.—April 21. Found a thrush's nest placed against the garden-wall, resting on the trellis and supported by a branch of a fruit-tree, but it being leafless the nest was quite exposed. My every motion was watched, but the bird did not leave its nest, probably fearing to expose the eggs, the weather being still unseasonably cold: thermometer yesterday at noon 38°.

Chiffchaff.—May 1. Observed first chiffchaff.

Willow *Yellow Wood Wren.*—May 5. First observed this species. By the middle of the month several nests were found on a warm bank in the garden. One, containing its full complement of eggs, was placed under a small furze-bush; the rest among the long withered grass beneath trees, where they might have been trodden under foot. I was surprised at finding so many of their nests, and that, too, so soon after their arrival. It would appear that both this and the preceding species build more freely here than in the south. I have observed but few in the Isle of Wight during the breeding season, nor do I remember finding their nests in the under-cliff.

Swallow.—May 7. Saw two swallows. This species is not so common as in the south, and the martin is still less numerous.

Swift.—May 9. First observed the swift. A few days later found them constructing their nests in the fissures of the rock in a disused quarry. The swift abounds in this locality, more so than in any part of England with which I am acquainted.

Heron.—May 21. Went over to Forres, and from thence walked up the left bank of the Findhorn, till an elevated ridge was reached, opposite to and commanding the far-famed heronry, in a clump of dwarfish oaks on the right margin, which is but slightly raised above the level of the river, that here takes a sudden bend. On approaching the edge of the cliff or precipice, which is some hundred feet high, we were observed, and the herons rising simultaneously dispersed, leaving their young, apparently full grown, standing erect and motionless, some in the nests, others perched on the sides: all had a rigid and lifeless appearance. The leafless trees, too, with their gnarled, weather-beaten and withered lichen-covered branches, have a stiff coral-like appearance, and the large flattened nests a blanched and petrified look. A colony of jackdaws have taken possession of the opposite cliffs, the narrow stream only separating them from the herons. What the latter may think of the incessant clamorous cawing it is impossible to say, but their noisy chatter may be heard with about as much pleasure as a grave man listens to that of an intrusive vulgar neighbour. There are in a few of the trees three or four nests, some so low down as to be well nigh within reach. The heronry might not only be approached with facility from the left bank, by fording the stream, but is also accessible on the right, though covered and concealed by a wood of larch and other trees, where there is a rookery, the inmates of which would doubtless give the herons timely warning should an inroad be attempted from that quarter. I observed but one bird standing in the water, though at this season fish must be abundant. The sea-shore, their usual resort, is but a few miles distant. Both sides of the river are well wooded, larch and beech being the common trees; but some parts are bare, and the stream confined by shelving rocky cliffs. From the bold prominent point referred to, a magnificent view of the river is obtained, both above and below the heronry, and is in itself a sufficient attraction. The clear, crystal-like stream, owing to the continued drought, is now, apparently, little more than knee-deep, and, where the receding margins permit the greater expansion of the water, it is seemingly barely sufficient for the free passage of the larger salmon, which might readily be seen in their upward course.

Tern.—May. Numbers of these elegant birds are to be seen daily at the mouth of the Lossie, feeding and fishing as the tide ebbs, standing knee-deep in water, with outstretched and upraised wings.

Water Ouzel.—June 1. Procured a bird of this species: it is 7¼ inches in length, and 10¾ inches in extent of wings. Though well nigh a year old it has not attained its perfect adult plumage. It is not commonly met with on the larger rivers: I twice sought for it on the Spey, once twenty miles up the river, but did not fall in with it; neither did I find it on the Findhorn, and only once on the Lossie, near the village of Birnie, about three miles from Elgin; but I was informed by a miller that he had not observed their nests there of late years. Higher up the stream the dipper is said to be more abundant. The one referred to was flying up the stream, following regularly each bend in the river, never cutting off an angle. Having alighted on a stone a little above the level of the water, I approached it under cover of the furze-bushes, and, at the distance of about thirty yards, remarked that the body was in constant motion, not a mere flirting up of the tail, but a regular and graceful movement. Its flight is low and direct, like that of the kingfisher, but not so rapid.

Hooded Crow.—This species seems to be common.

Herring Gull.—Very abundant, and during the herring season a constant attendant on the shoals.

Coot.—Frequently observed on Loch Spynie.

Moor Hen.—A very common bird.

Robin.—Rarely met with: not one did I observe in the garden during my residence in the north.

House Sparrow.—Far less numerous than in the south, but quite as familiar. For instance, one day in spring on entering the house I found a sparrow with her brood in the hall: she was very emaciated, and her plumage worn and ragged. There can be little food for them early in the season in these northern villages. I noticed during the winter a dwarfish sparrow, fully a third less in size than those with which it was associated.

Magpie.—But once or twice seen, but there is little suitable cover near the coast.

Osprey.—When strolling on the sea-cliffs a large hawk was observed, probably the osprey. With buoyant flight it was ascending and descending in circular sweeps, but not having a glass I could not well distinguish the colours of the plumage, but brown seemed the predominant colour. During my stay in the north I saw but few hawks and no eagles.

Chaffinch.—A very numerous species, almost as much so as the greenfinch, and equally familiar, allowing one to walk beneath the fruit trees on which they are perched. On the 21st of April I observed a large flock of the latter feeding among the pear trees, but whether on buds or insects I did not discover. Nowhere have I found the two species so abundant as in the North of Scotland.

The goldfinch, so common a bird in the south, was not met with, though its food is plentiful enough. I have observed that most species of birds are tamer, or easier of approach, than with us, owing doubtless to their being less sought after or molested. The small birds may be considered "poor fowl," and not worth the powder and shot, as a Manx man observed of snipes.

HENRY HADFIELD.

On the Nest and Eggs of the Coach-whip Bird and of the White-fronted Epthianura, with some General Remarks on the Nidification of Australian Birds. By A. DOBRÉE, Esq.*

As neither Mr. Gould's work on Australian Ornithology nor such others as I have been able to consult contain any particulars of the nidification of the two above-mentioned species, I am led to the conclusion that, although probably casually discovered, no description has as yet been published, and beg therefore to communicate the following notes, from personal observation.

1. PSOPHODES CREPITANS, Gould. *Coach-whip Bird.*

This bird is well known to most Australian colonists, though, probably, far more frequently by the peculiar note whence it derives its current name than by its appearance, as it generally keeps itself concealed amidst thickets and brushes. To naturalists this species is extremely interesting, as its singular characteristics have long rendered it a matter of doubt what precise place to assign to it in the ranks of Australian birds. The details of its nidification may lead to the further elucidation of this point.

It will not be out of place first to quote a few of Mr. Gould's very accurate remarks on the habits of this bird. He says, "It is only to be found in dense brushes, and is a shy and recluse species; for, although its full notes—ending sharply like the crack of a whip—indicate its presence, it rarely exposes itself to view, but generally keeps in the midst of the densest foliage and amongst the thickest climbing plants, frequenting alike those that have intertwined themselves with the branches of the tallest shrubs and those that form almost impenetrable masses near the ground, and through which it threads its way with the utmost ease. It is extremely animated and sprightly in all its actions. Of its nidification, I regret to say, I know nothing, although I paid great attention to the subject myself, and offered rewards for its nest and eggs, and for any information respecting them."

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* Read before the Royal Society of Victoria, August 27, 1860, and obligingly communicated by N. F. Dobrée, Esq.

The present nest and eggs were obtained by me near the banks of the Yarra Yarra, near Heidelberg, on one of those points of land, or "bends" of the river, still left in their original state, and where the underwood and tangle are extremely dense. Being on a visit in the neighbourhood, on the opposite side of the river, late in the previous summer, my attention was attracted by the remarkable note of this bird, but as the breeding season was then past, I merely noted its haunt. Finding, however, on reference to Gould's work, that its nidification was unknown, and relying on a general fact I had often observed, namely, that the same pair (apparently) of birds will, if undisturbed, return for several years to the same locality for breeding, I revisited the spot about the commencement of the next summer, and, after a short search, was rewarded by the discovery of the nest, on which the female bird was sitting so closely as almost to allow herself to be captured; thus removing all doubt as to the identity of the nest and eggs. The nest was in the most tangled part of the thicket, and placed in the forked branches of a shrub, about four feet from the ground: it is cup-shaped, about five inches outside diameter; the exterior of dry slender twigs, and the interior lined with thin fibres and a few pieces of horse-hair, the latter evidently owing to the accidental vicinity of some farms; the whole structure is neither very solidly nor elaborately built. It contained two eggs; length exactly one inch; extreme width, three-quarters of an inch. In shape they are not much pointed at the thinner end, and the greatest girth is at about the middle. Their ground colour is pale greenish blue, with streaks and dots of various sizes scattered pretty equally over the whole surface: these markings are of a brownish black colour, and of two kinds, the one being very distinct and sharp, the other somewhat less numerous, more grayish and much fainter, having the appearance of being under the shell. From the fact of the bird sitting so closely, I conclude that no more than two eggs are generally laid, though the present ones had not yet been perceptibly incubated.

I regret to say I have kept no precise memorandum as to the date of finding the nest, but believe it to have been about the end of October.

2. Epthianura albifrons, Gould. *Whitefronted Epthianura.*

This bird, which, at the first cursory glance, recalls the familiar English water wagtail, both by its general appearance and motions, is by no means uncommon round Melbourne.

Mr. Gould writes as follows in his notice of this species:—"I first met with it in a state of nature on the small islands in Bass's Straits, where it had evidently been breeding, as I observed several old nests in the barilla and other stunted shrubs; its natural province is the ground, to which it habitually resorts, and it decidedly evinces a preference for spots of a sterile and barren character;. it trips along with amazing swiftness, with a motion that can neither be described as a hop nor a run, but something between the two, accompanied by a bobbing action of the tail. Of its nidification, I regret to say, nothing is at present known."

It may be met with in the dry portion of the swamps extending between the Saltwater and Yarra rivers. I discovered its nest about four feet from the ground, in a stunted bush, on the edge of the dense "tea tree" scrub, which covers part of that locality. The structure is cup-shaped, somewhat deep and about four inches outside diameter; dried fibres, fine twigs and stalks form the exterior, and the lining is composed of horse-hair and fine grasses. It contained three fresh-laid eggs; length eleven-sixteenths of an inch; extreme width seventeen-thirty-seconds of an inch; shape not much pointed; ground colour white, with fine red-brown markings, consisting of points, streaks and rounded dots, the larger markings being most abundant at the thicker end, where they form a sort of wreath, while some of the smaller ones are scattered over the other parts of the surface. The markings are, in nearly every case, surrounded by a faint ashy margin of their own colour, imitating the appearance of their having been painted on the white ground before the latter had properly dried, thus causing them partially to run into the white surface. This seems to be a decided characteristic in these eggs. The nest was discovered about October.

Mr. Dobrée then proceeded to make some general remarks on the most interesting forms of nidification of Australian birds, in which respect he stated this country maintained its reputation for singularity. He alluded to the mound-raising Leipoa, or mallee-scrub pheasant, an egg of which he exhibited; the yellowtailed Acanthiza, of whose singular double-roomed pendant nest a specimen was shown; and remarked on the burrowing habits of the Pardalotus, as well as the hanging structure of the yellowthroated Sericornis, which he produced for inspection; he also recurred to the fact of the Australian representatives of the cuckoo family, though deprived of the familiar note, differing in no way from their European cousins in their habit of confiding their progeny to foster-parents. He further exhibited a valuable collection of

Australian eggs, including that of the lyre-bird (*Menura superba*), of which hitherto only a limited number of specimens has been obtained; and pointed out that many further observations were still desirable for the completeness of information in this branch of Natural History. He remarked, in conclusion—

One of the secondary causes of the often-noticed scarcity of birds in Australia, as compared with England, is undoubtedly that so many species here lay a much less number of eggs. Amongst the commoner of Australian birds, the honeyeaters (*Meliphagæ*) average two, and some species only one solitary egg; the wattlebirds (*Antocheræ*) two or three; the Sericornis tribe, three; the Zosterops, three; the wood swallows (*Artamis*) four, &c.; and this opinion is corroborated by the fact that the few exceptional species whose individuals are really numerous, such as the common quail (*Coturnix pectoralis*) and the parokeet tribe, are found to be large layers, the quail producing eleven to fourteen and the parokeets six to eight eggs. In England, nearly all our commoner birds average five, or at least four eggs, and there are many instances of a larger number. I said that this is a secondary cause, for reason at once ascends higher in the scale and asks *why* it should be so arranged that only a limited average is produced? Is it that this country would, in the case of most species, not offer sufficient food of a suitable kind to maintain a greater number of individuals, and therefore the all-balancing hand of Nature has struck the present adjustment as the true one between supply and consumption? Or, to change the line of inquiry, can we entertain the notion of a more recent origin of Australia, and thence deduce that the scarcity of animal life is in some degree owing to the fact that the same amount of time has not elapsed as in the older countries to enable this continent to be stocked up to its full capability? However this latter may be, it is certain that the rate of reproduction, as represented in the instance of most Australian birds, cannot be proceeding at a rate nearly equal to the annual increase in many other countries. In order to investigate fully this subject of the abundance or scarcity of animal life, it would, however, be necessary to take into account the different destroying causes in the countries under comparison, as well as the reproducing ones; and altogether the matter is one which deserves more than the few hasty glances here incidentally bestowed upon it.

Two Days at Madeira. By Alfred Newton, M.A., F.L.S., F.Z.S.

To a naturalist, beyond any other traveller, I think, the aspect of a country he is visiting for the first time, in whatsoever part of the world it may lie, is a matter of great and never-ending interest. This interest is, of course, greatest in the case of a country whose natural productions are entirely unknown; but it would not be inconsiderable even in one, if such there be, whose Fauna and Flora have been already thoroughly worked out. It accordingly follows that localities of the intermediate and most numerous class, where the animals and plants are already more or less catalogued, must possess an interest inversely proportionate to the amount of facts which are on record concerning them. Such an instance of the middle class is offered by the cluster of islands known as the Madeiras, the field wherein one of the most reflective and diligent zoologists of our time has so long laboured. Even of those among us who take no special heed of Entomology, there can scarcely be one who has not been charmed with the writings of Mr. Wollaston, whether from the ardent love of nature and the keen powers of observation they betray, or the masterly handling of results and the sound inductive philosophy they evince. Ornithologists may well wish that a naturalist so gifted had paid as much attention to the birds of the Madeiras as to its beetles, and this without in any way depreciating the useful information respecting the former, furnished at various times by Mr. Edward Vernon Harcourt.* It is rather in the hope of encouraging some one who may have the opportunity of further studying Madeiran Ornithology that I venture to offer the following remarks; for I myself, during my late short visit, collected no specimens, and made no personal observations, possessing any novelty.

The European character of the Madeiran Fauna is well known. Of the ninety-nine birds included in Mr. Vernon Harcourt's latest and most complete list (Ann. and Mag. Nat. Hist., June, 1855, 2nd ser. vol. xv. pp. 430—438), only *one*, Procellaria pacifica, *Aud.* (if that be a good species, and rightly identified, which I think open to doubt), appears to be a straggler from the New World; but *three* are to be considered African, Musophaga africana, Porphyrio Alleni and Procellaria mollis*; while *four* are given which are common and peculiar to the neighbouring Atlantic islands, Fringilla butyracea, F. Tintillon, Cypselus unicolor and Columba Trocaz. To these latter may probably be added Anthus Berthelotii, first distinguished by Dr. Bolle (Ibis, 1862, pp. 343—348, and Journ. f. Orn., 1862, pp. 357—360) as distinct from A. pratensis, under which name he supposes that it figures in Mr. Vernon Harcourt's list, and making therefore *five* species which are not inhabitants of other parts of the world. There is besides *one* species which, as far as is known, is confined to Madeira only, Regulus maderensis.† The remaining *eighty-nine* have never been accounted otherwise than identical with European species.

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* "Notice of the Birds of Madeira," P. Z. S., 1851, pp. 141—146, reprinted in Ann. and Mag. Nat. Hist. 2nd ser. vol. xii. pp. 58—63; 'A Sketch of Madeira,' London, 1851, pp. 115—123; "Description of a New Species of Regulus from Madeira,' P. Z. S., 1854, p. 153; and "Notes on the Ornithology of Madeira," Ann. and Mag. Nat. Hist., 2nd ser. vol. xv. pp. 430—438.

It is a very true remark of that prince of observers in Natural History, Gilbert White, that "that district produces the greatest variety which is the most examined." Hence I cannot but infer that the species of birds to be found in the Madeiras are much more numerous than even Mr. Vernon Harcourt's catalogue shows. I have the greater confidence in this belief from information given me by a gentleman resident in those islands. He told me he had himself, though paying no particular attention to the subject, met with several species, of which he did not know the names, not included in that list. Islands situated at a distance from other lands seem to be much resorted to by birds that, in the course of their periodical migrations, have gone astray; and it only requires the constant presence of a good watchman to secure these stragglers and record their occurrence. This I believe to be the chief reason for the otherwise unaccountable richness of the Ornithology of an isolated rock, like Heligoland. Now, unfortunately, the Madeiras do not possess a Herr Gätke: as far as I am able to learn, they have not a single ornithologist permanently resident and always on the look out for a novelty. Ornithologists, and some of them good ones, have visited the island, nay, have passed perhaps many seasons there; but their powers of observation have often been limited by other causes. They have either been invalids themselves, like Dr. Heineken,* or have been the companions of invalids. Consequently, of the character of the casual additions to the Madeiran avifauna we are quite ignorant. On the other hand, I do not suppose that the number of species really inhabiting the islands is likely to be materially increased by any future observations.

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* This species, although figured by Mr. Gould in his 'Birds of Australia' (vol. vii. pl. 50), probably only occurs in Australian waters as a straggler. It is stated by him to be "very abundant from the 20th to the 40th degrees of S. lat." (Ann. and Mag. Nat. Hist., vol. xiii. p. 364). Its only known breeding place, as far as I am aware, is on the Dezertas, whence my friend Dr. R. T. Frere has had many specimens.

† Mr. Darwin appears to have overlooked this decidedly distinct species, when he states ('Origin of Species,' p. 391) that "Madeira does not possess one peculiar bird."

Still there is much in the Ornis of the Madeiras that merits or requires further elucidation. The facts that Scolopax rusticula is stationary all the year, and constantly, though in small numbers, breeds in latitude 33° N., and that Petronia stulta, departing from its customary habits of seclusion on the continent of Europe, is met with on trees in the centre of the town of Funchal, are such as, if they did not come to us on undoubted authority, would scarcely be credited. It is almost impossible that these should be the sole exceptional peculiarities of their kind in Madeiran Ornithology.

To British oologists the Madeiras have for some years been known as the locality whence they have obtained a plentiful supply of the eggs of various Procellariidæ. These were, I believe, first imported into this country by my friend Dr. R. T. Frere; and it is very much to be regretted that we have so little information respecting the breeding habits of the birds which produce them. Some of us who are afflicted with the mania for egg-collecting, and who are sceptical on every point pertaining to our favourite study, have expressed doubts as to the genuineness of the specimens called by the name of Puffinus obscurus. These entirely want the strong musky smell which is so characteristic, as far as we know, of eggs of the whole family; and, I believe, insinuations have been occasionally uttered respecting the bantam hens which might be kept to lay these valuable objects. I confess to having been at one time among the disbelievers; and therefore I feel bound to record the fact, of which I was not formerly aware, that the Dezertas are uninhabited islands, and consequently that there is no domestic poultry there. At the same time I wish I could hear of some ornithologist visiting these barren rocks at the breeding season, and putting the matter for ever at rest.

The geological relations of the existing Fauna and Flora of the Atlantic isles and the European continent have, as far as known, been treated by much abler hands than mine; and I can scarcely hope to add any reflections on the subject which are worth the printing. Yet hitherto the birds of these interesting groups (the only relics of an

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* I have not seen the paper said to have been published by this naturalist in the 'Edinburgh Journal of Science,' 2nd ser. vol. i. p. 229, and am only acquainted with that in the 'Zoological Journal,' vol. v. pp. 70—79.

Atlantis which ever had a real existence) have been entirely neglected from this point of view. I cannot persuade myself that an examination of their Ornithology would be void of result; and I would here beg to offer one remark on the peculiar distribution of the species of the genus Fringilla, as now restricted by most ornithologists. It contains six very well-marked forms; and the following list exhibits their breeding range, as well as I can ascertain:—

1. F. montifringilla; Northern Europe and Asia.
2. F. cœlebs; Europe and Asia, from lat. 68° N.
3. F. spodiogena; Algeria.
4. F. Moreleti; Azores.
5. F. Tintillon;* Madeiras, Canaries, Cape de Verde Islands?
6. F. teydea; Canaries.

Thus showing that one half of the known species are confined to the Atlantic Islands—a fact suggestive enough to those who are acquainted with the deductions inferred from similar cases by Professor Edward Forbes, Mr. Wollaston, and, chief of all, Mr. Darwin.

In connexion also with this topic, I would remind my readers of Mr. Wollaston's admirable remarks on the effects of isolation and exposure to a stormy atmosphere upon the insect world.† I fully believe that similar effects are to be traced among birds; and, if I am not mistaken, the first and most apparent effect of the latter cause is an obscuring or darkening of the plumage. We have examples of it in our own country. Few of our native birds attain the brilliant hues observable in their continental brethren. When do we ever see an English yellow bunting or a bullfinch as brightly coloured as a French, or, still more, a German one? The dark back of our pied wagtail has led it to be described as a species distinct from the continental Motacilla alba. Our longtailed titmouse is equally deserving of a like recognition. I will say nothing here of the *quæstio vexata* of the difference between Lagopus scoticus and L. albus; for in that case probably other causes have come into play. If we go to the other extremity of the Palæarctic region, we find the same thing occurring. Orites trivirgata differs from the continental O. caudata, just as our own longtailed titmouse does. Accentor rubidus bears the same relation to the continental specimens of A. modularis as our own hedgesparrow.

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* One of my fellow-passengers informed me that some difference was observable between the specimens of this bird killed in the northern and southern parts of Madeira. I hope to obtain confirmation of this.

† 'Variation of Species,' p. 70 *et seq.*

In a word, several, perhaps many, British forms are repeated (I do not say exactly, but to some degree) in Japan. If I am right, how can the fact be reconciled with the doctrine of the continuity of specific areas? Simply, I imagine, by similar conditions obtaining in localities so far apart; and the most obvious of these similar conditions I take to be the prevalence in both localities of an insular, as opposed to a continental, climate. Mr. Vernon Harcourt has already remarked that "all the birds of Madeira are darker than their European brethren;" and I can of my own knowledge confirm his statement in several instances. The variation here observable is very much greater generally than in the case of British as distinguished from continental forms; and Mr. Wollaston has pointed out the probability of variation being dependent on the length of the period through which isolation has lasted. It is, accordingly, well to examine the evidence afforded by Geology. Professor Edward Forbes supposed that the Madeiras and other Atlantic Islands were the summits of a Miocene continent;* and Sir Charles Lyell has quite lately declared his belief that, "waiving all such claims to antiquity, it is at least certain that, since the close of the newer Pliocene period, Madeira and Porto Santo have constituted two separate islands;"† while he further asserts that the naturalist is "entitled to assume the former union, within the post-pliocene period, of all the British Isles with each other and with the Continent."‡ It, therefore, appears to me that the differences of variation observable between the birds of the British islands and Madeira respectively and those of the Continent of Europe are exactly in accordance with these statements.

The foregoing remarks I have made only in the hope of showing how much more remains to be done by the ornithologist in the Madeiras. I must now recount my own impressions, formed during my short stay of two days. On October 20th, 1862, I left Southampton, a passenger on board the Royal Mail steam-ship "Tamar." We had a rough night of it going down channel, and the following morning found ourselves at anchor in Torbay, where our captain determined to wait till the spell of bad weather was over. How it rained, and how it blew, and how those on board managed to kill time, I need not here say. The scenery of that beautiful bay, to me so familiar, was generally obscured; but every now and then one obtained a glimpse of some well-known feature, bringing back lively and pleasurable reminiscences of more than ten years since. One agreeable circumstance of our three days' detention was the recognition of a party of old friends, whose acquaintance it had been my good fortune to make several years before in far distant latitudes. A company of about thirty Pomatorhine skuas (*Lestris pomatorhinus**) were in close attendance on our ship, and about as many more round each of two other craft, weather-bound, like ourselves. They were very tame, coming close alongside the quarter-deck in quest of food; and dire was the strife, and loud the contention, as one lucky bird after another seized on some choice morsel, and conveyed it far astern to devour it at leisure. Late in the evening of the 23rd the wind shifted, the glass rose; and shortly before midnight we had our steam up, our anchor weighed, and we were rounding, first, Berry Head, then the Start, and then were fairly on our course for Funchal. The next few days were passed as days are commonly passed at sea. We had favourable weather, and the passengers came gradually creeping up to deck, as flies show themselves in the first sunny days of spring. Two or three gulls, apparently kittiwakes (*Rissa tridactyla*), occasionally convoyed us; and the various persons on board slowly fraternized. I was gratified to find several representatives of zoological science among my companions,—Mr. William Hinton, to whom Mr. E. Vernon Harcourt was indebted for many ornithological facts, as recorded in his earliest paper; Mr. J. Y. Johnson, who has lately pursued the subject of Madeiran Ichthyology with as much zeal as success; and Mr. Robert Swift, the well-known conchologist, of St. Thomas, West Indies. On the 28th, about noon, we were boarded by a pretty Saxicoline bird, no doubt a South-European species, and I should suppose, either Saxicola stapazina or S. aurita; but as it was to all appearance a young bird in the first plumage, and I am not acquainted with either form in its immature dress, I could not be certain. It was tame enough, but declined to take any notice of a few crumbs of bread (all I had to offer by way of hospitality); and it did not stay with us very long. About five o'clock in the evening, land was announced on the starboard bow, which our captain recognized as Porto Santo. By the time I got on deck it was shrouded in a heavy rain-cloud, and required some amount of faith to believe in its existence. Later it became much plainer, and we ran by it, then sighted Madeira proper and the Dezertas, and finally dropped our anchor in Funchal Roads about midnight.

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* 'Geol. Survey of the United Kingdom,' vol. i. pp. 348—350, and p. 400.

† 'The Antiquity of Man,' p. 444. ‡ Ibid. p. 277.

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* I fully accept Herr Preyer's derivation of the name of this bird, commonly written "pomarinus," and Dr. Sclater's emendation of the same ('Ibis,' 1862, p. 297).

Next morning, looking out of the port-hole, the first thing that attracted one's attention was the intensely blue water—so blue as to appear almost opaque. The sky was clouded, and the hills above the town draped in mist. Our steamer was surrounded by gay-looking boats, stocked with live turtle, bananas, and neat wicker cages crowded with canary birds. The moment an unwary passenger showed himself in the waist, a general chorus of tawny boatmen in indifferent English invited him to go ashore. By the kindness of one of our fellow-voyagers, horses had been ordered for my brother, my nephew and myself. When we got on to the beach, and had satisfactorily concluded the wrangle inevitable in such cases, as to boat-hire, the rain began. We paddled about the town for a couple of hours or more, as the idea of starting on a ride was absurd. We looked into the fruit-market; were offered a string of semiputrid quails by a man in the street (said quails being decidedly darker in colour than our Coturnix dactylisonans); visited the Convent of Santa Clara, whose inmates have an ornithological turn, since they make very pretty artificial flowers out of feathers; and finally inspected the fort, which is defended by certain soldiers of His Most-Faithful Majesty, and a glacis covered with prickly pear. From the ramparts a good view of the town is obtained; but what I looked at more was some three or four couple of small dark swifts (*Cypselus unicolor*), which were wheeling to and fro under its walls. Beautiful little birds they were, and a very good living they seemed to be making, judging from the constant rapid jerks in their flight, and the abundance of small insects that, in spite of the rain, filled the air. At length the sun shone out, and in desperation we determined no longer to defer our ride. Accordingly the horses were brought out, and off we started at a gallop, each of us being accompanied by a man (a *burriquiero*) whose business it is to hang on by the tail. The first mile was over the stones, and up a hill so steep that, having some regard to my reputation for veracity, I shall refrain from mentioning what I believe to be its angle of inclination. I can only say I do not think I ever rode (much less gallopped) up a more tremendous ascent. Each side of the road was bounded by high walls, festooned and overhung with brilliant flowering plants; but every here and there one obtained a look-out. The rain came on again, more heavily than before, accompanied by a storm of wind; and we several times had to take shelter from it. At length we arrived at the Church of Nossa Senhora do Monte, upwards of 1900 feet above the sea, which forms so conspicuous an object from the bay. Here we turned sharply to the right, the weather improved, and after emerging on a comparatively open country, arrived at a spot which the fragments of broken glass showed to be a favourite picnic ground. A beautiful prospect was before us. At our feet lay Funchal, with its heights all dwarfed; to the eastward the craggy Dezertas, the home of a thousand petrels, looking unspeakably desolate, notwithstanding the golden glare with which their peaks were lit up; and extending far away to the south and west nothing but the calm sea, overshadowed here and there by a passing cloud. After enjoying this view for some little time, we turned our horses' heads, presently stopping at a small cottage—a *venda*—where our attendants begged a draught of wine. Horrible stuff it was, manufactured, if our tastes could be trusted, chiefly of rum and raisins. Fine Spanish chestnuts and thriving pinasters were dotted about; and passing down a rocky gully, a buzzard (*Buteo vulgaris*) flapped slowly from the top of a half-dead tree. At length we reached the object of our ride—the Curral dos Romeiros, a secluded valley, placed among a multitude of wild ravines. A small stream ran at the bottom, and made its exit, sparkling in the light, through a narrow gap. Crossing this, we ascended the opposite side, disturbing two or three more buzzards; and, finally, striking the Caminho do Palheiro, were soon in the town, where we re-embarked on board the steamer.

Next morning we were on shore again betimes. A kind friend, who had invited us to breakfast, met us on the Praza, and accompanied us to his own house. I took a seat in an ox-sledge, which is the form of vehicle that in Funchal represents the Hansom cab of the British metropolis. The streets are paved with small flat pebbles, set edgeways, over the well-worn surface of which these sledges glide easily, their progress being assisted, like those at Amsterdam, by the occasional application of a greasy rag to the runners. Notwithstanding this precaution, however, so heavy is the draught up the steep hills, that the poor beasts were constantly down on their knees. At length we arrived at our friend's house, a pleasant *quinta;* and having done justice to his hospitality, and admired the view from his garden, we started on our expedition to the Curral dos Freiras. The day was beautiful. As we rode on, the strangeness of the scene struck us with increasing force at each succeeding step. On each side were fields of corn or sugar-cane, cabbages or yams, or sometimes a vineyard that had survived the ravages of the Oïdium, studded with orange or apple trees, and intersected by high rows of fuchsias or blackberries; while overhead were fig trees and pines, poplars and dates, enough to confuse for ever one's notions of geographical Botany,* and rivalling the odd jumble of the classic "Groves of Blarney." We passed over a comparatively low range of hills to the north-west of the town, when a wonderfully bold headland, Cabo do Girao, upwards of two thousand feet in height, appeared on our left; then a deep ravine, the channel of the Ribeiro dos Socorridos, spanned by a viaduct of almost Roman proportions. About the streams of water, whether natural or artificial, were numerous gray wagtails (*Motacilla sulphurea*), a species I had long known, on Mr. Hewitson's authority, to be found in the island. Flocks of linnets (*Linota cannabina*), the cock birds with their breasts still crimsoned, rose twittering cheerfully from the furze-bushes and cactus-thickets by the road-side. In the air were poised dark-plumaged kestrels (*Tinnunculus alaudarius*, var. *rufescens*, Sw.), occasionally dropping down, I presume in quest of the lively little lizards (*Lacerta Dugesi*), of which plenty showed themselves on the dry stone walls. As we gradually reached a higher level, we were favoured by a repetition of yesterday's rain. At length, passing by the Jardim da Serra, and through a wood of Spanish chestnuts, which no doubt would have been picturesque had we been able to see it, we emerged at the foot of a steep slope overgrown with coarse grass. Here we got off our horses, and were each set upon by a couple of natives, who seemed to think it impossible for an Englishman to reach the top without hoisting him up. Partially availing ourselves of their assistance, we arrived there after a little trouble (for the grass was wet and slippery), and found ourselves on the brink of a tremendous crater-like gorge, occupied by a bright rainbow, far, far, below us. A magnificent sight it must be in fine weather; but the clouds filled the valley beneath, so that its bottom was hardly discernible, and clung obstinately to the mountains above, only for a few moments breaking to reveal Pico Grande, the highest point of the island. Being by this time wet through, we thought it advisable to retrace our steps. Riding down hills is generally worse than riding up them. Here it was awful work, but we at last accomplished it without mishap. We returned by a different route, crossing the valley before mentioned much lower down, over a fine bridge and a half-finished causeway leading to a level new road—a gratifying change after the ups and downs we had encountered. I went to visit a gentleman (Dr. O'Herlehy) who, I had been kindly informed by Mr. Johnson, was a great bird-fancier, and in whose house

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* It will, of course, be understood that nearly all the prevailing plants are introduced species.

I hoped to see examples of the curious variety of the blackcap (*Curruca Heinekeni*, Jard. & Selby) and other Madeiran birds alive. Unfortunately the doctor was not at home, and, what made it worse, had the key of his pets with him. Then, following my companions, we went on board ship; and about an hour after sunset, amid the blaze of blue lights, the "Tamar" steamed away, and Madeira vanished into a memory.

ALFRED NEWTON.*

Elveden, February 28, 1863.

Struthionidous Birds, Extinct and Recent.

THE former existence of huge struthionidous birds in several and distant localities is one of those facts which, at first received with hesitation and doubt, have of late years forced themselves on our notice, and made themselves part and parcel of the science of Natural History. There is much teaching in the assured discovery that the magnitude of the species constituting a family or order was at some, and perhaps not very remote, period, vastly superior to what it is at the present time: this fact, now clearly established, receives additional importance from the cognate fact that the larger animals still lingering on the earth are gradually disappearing even while we are speculating on the subject, and are undergoing the inevitable process of being removed from the category of things that are into the catalogue of things that were. Yet in almost every instance these colossal creatures have left representatives behind them which serve as guides to their systematic arrangement; thus Colossochelys is represented by Testudo, Iguanodon by Iguana, and the crocodile in the oolite of Poictiers, estimated by Valenciennes to have been at least a hundred feet in length, has its likeness stamped on the comparative lilliputian which still floats log-like on the waters of the Nile. As with reptiles, so with sucklers: the Megatherium is represented by the diminutive sloth: the mammoths and mastodons of earlier ages are brought vividly before us by our living elephant. Again, among birds the dodo is said to be typified by Didunculus, Æpyornis by the ostrich, Dinornis by the cassowary and mouruk. It requires neither the research nor the imagination of a Darwin to accept the teaching which these facts afford; such bulky creatures require space and solitude; we express our surprise that the dodo should disappear, whereas the greater wonder would be that it should remain; how could it exist with man for a companion and an enemy? The Æpyornis, in like manner, has yielded its place to man: when New Zealand was discovered the moa was certainly in existence, and has existed almost up to the day in which we live. The vast solitudes of the Great Sahara still protect the ostrich; and the boundless wastes of South America preserve the Rhea from destruction; these inhospitable regions bid defiance to man, and hence offer a refuge to the creatures that man would inevitably destroy. The emeu, cassowary, mouruk and kiwi are certainly doomed, unless, under the care of some such protector as Mr. Bennett, they should be converted into domestics, and, like the camel and the horse, lose all claim to the title of *feræ naturâ*. There is no necessity for any hypothesis, there is nothing inconsistent with the immutability of species, in the fact that the dodo has expired: so would the mouse if shut up with the cat: in all the changes now in progress we shall find no indication of any more miraculous power than this, that civilized man is forcing his way into every corner of the earth, and that while his advance favours the increase of his parasites, the rat, the mouse, and the sparrow, it is fatal to the existence of those bulky creatures which strive, but strive in vain, to escape the influence of his presence.

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* Reprinted from the 'Ibis,' April, 1863, and obligingly communicated by the author.

These observations are induced by the simultaneous receipt of papers so replete with interest as those which I have here associated; papers which it must ever be the chief aim, the legitimate object of the 'Zoologist,' to preserve from oblivion, to set them up in the desert of time as landmarks by which some future Cuvier may shape his course.

Mr. Rowley's paper takes precedence of the others, not only because it is of earlier date, but because it goes back to a more remote period in the history of these giant Struthionidæ: the observations by Mr. Buller, followed by the invaluable researches of Mr. Allis, serve to link the past with the present, while Mr. Bennett's praiseworthy efforts show what may yet be accomplished in the way of inducing those huge wingless birds still to linger on earth's surface under the fostering care of man.

It has been my good fortune to be permitted to see and examine the huge egg which forms the subject of Mr. Rowley's paper, and it is therefore with peculiar pleasure that I transfer his description without note or comment to the pages of the 'Zoologist;' but my readers will, I am sure, see that in printing opinions so opposed to each other as some of those which are here collected, it is impossible for me to endorse the whole. To neither communication have I made the slightest addition; but I have eliminated from Mr. Rowley's treatise a great deal that did not appear to me to be perfectly relevant or in any way essential to the right understanding of this most interesting subject. Mr. Rowley must now speak for himself. I ought to add that the short notice of my friend Mr. Allis's paper on Dinornis robustus is penned by myself.

EDWARD NEWMAN.

The Egg of Æpyornis maximus, the Colossal Bird of Madagascar.

By GEORGE DAWSON ROWLEY, M.A.*

THREE different parts of the world appear to have possessed enormous tridactyle birds. North America points to the footprints of the Brontozoum giganteum in the sand stones of the Connecticut valley; New Zealand boasts her fifteen or twenty species of Dinornis, of which the moa (*Dinornis giganteus*) is the largest, and Madagascar has lately revealed to us the [former] existence of the Æpyornis maximus. The Brontozoum giganteum belongs to the triassic period of Geology, the vast antiquity of which, in some degree, weakens our interest. For the mind's eye, retrospectively looking, takes dimly into its vision an object seen through countless ages of bygone time. The two island giants are well ascertained to have existed not very remotely, in fact in "the Recent;" and come home to our imaginations in all their vivid reality, as things only of yesterday, or perhaps even [of] to-day, as is thought by some, though of this I never have had any very great hope. * * *

There are three eggs of the Æpyornis maximus extant, the largest and finest eggs in the world. Paris possesses two and some fragments, the one in my collection is the third. When I purchased this, I was assured that it exceeded in magnitude the two others, which I find, from a paper entitled 'Compte Rendu des Séances de l'Académie des Sciences,' No. 4, 27 Janvier, 1851, par M. Isidore Geoffroy Saint-Hilaire, tome xxxii. p. 101, to be the case. * * *

Its dimensions are as follows:—Shape an ellipse; major axis 12¼ inches; minor axis 9⅜ inches; great circumference 34$\frac{3}{16}$ inches;

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* Reprinted in part from a pamphlet of sixteen pages, published by Trübner & Co., Paternoster Row. 1864. Price one shilling.

small circumference 29⅛ inches; weight avoirdupois 3 lbs. 11½ oz. nearly. Contrast these with the following, taken from ostrich eggs in my cabinets:—Smooth North-African ostrich [egg]: major axis 6⅛ inches; minor axis 5 inches; great circumference 18¾ inches; less circumference 17 inches. A rough South-African ostrich [egg] has major axis 5⅝ inches; minor axis 5 inches; great circumference 17⅝ inches; less circumference 16½ inches. The former of these was picked out as a very large egg, but the axes of the Æpyornis give nevertheless a proportion of nearly two to one. Are we, then, to make the former double the altitude of the ostrich, *viz.* 14 or 16 feet? This question has been dealt with by M. Geoffroy Saint-Hilaire, from whose writings I derive chiefly my knowledge of the bird and its bones. He is of opinion that we cannot go that length. With the Paris eggs came the lower portion of the metatarsal of the left leg, found in the same locality with at least one of the eggs. This, he says, indicates a bird with shorter legs in proportion than the ostrich, yet with a much thicker body, and he puts the height of the Madagascar bird at between three mètres and four mètres, *i.e.* 9 feet 10·11237 inches and 13 feet 1·48316 inches, and leans to the belief that it slightly exceeded the New Zealand species in altitude. He computes the contents of his eggs at about 8¾ litres, *i.e.* about 7 quarts 1 pint, and equal to those of six ostriches, seventeen emeus, or one hundred and forty-eight hens, a statement which Professor Owen confirms, but justly says, that eggs of birds are not always in proportion to the size of the species which lay them. It is true this is most strikingly the case in Apteryx Mantelli or kiwi, the fresh egg of which, as stated by Dr. Sclater, weighs 14½ oz., while the living bird is 60 oz., so that the egg is nearly equal to one-fourth of the bird. * * *

The first Paris egg [of Æpyornis maximus] was discovered in 1850 by M. Abadie, captain of a merchant vessel, in harbour at Madagascar, on the S.W. coast of the island. This was perforated at the end, and used by a native for domestic purposes. Soon after another perfect specimen of nearly equal volume, taken from the bed of a torrent, in the remains of a small landslip (*parmi les débris d'un éboulement*) came to light from the N.W. extremity. Later, a third [egg] and some bones were discovered in a recent formation. This last egg was unfortunately smashed on the voyage to Paris, where the three were sent by M. Malavois, a French gentleman of the Island of Réunion or Bourbon, who received them from Madagascar. My egg was found at Mananzari on the east coast (this is not Mananhari farther north on the same side) at a depth of forty-five feet in a hill of ferruginous clay, "dans le terrain diluvien," by Malgaches when digging for an iron mine, and was sent to the Mauritius and thence forwarded in 1858 to Paris, by Messrs. Thomas Lachambre and Co., of that island. * * * Some bones are said to have been found with the egg, but they were unfortunately broken before they were taken out. This I the more regret, because the fragments at Paris are so very imperfect. The surface is much stained with clay, consequently the fine lustre, which I suppose it originally had, has vanished. The colour was probably the same, when first laid, as that of the ostrich (*Struthio Camelus*), *viz.* a pale yellow-white. In granulation it resembles South African specimens of the same bird, but the indentations are vastly coarser and larger. * * * Nature has taken care to wrap up the egg of the Æpyornis maximus in a shell of the very greatest strength: had it been otherwise it could hardly have stood the wear and tear it must have undergone, for though the bird has existed probably in modern days, yet it, I should say, only lingered. Therefore, this last-found egg may be many hundred years old, but taking it at two hundred years, that is a long time for an egg to remain in clay. In my specimen some heavy substance rattles when shaken, and I have been asked if it contains an embryo—but I do not think this likely: perhaps it may have in it one of those calculi common in ostrich eggs, which vary in size from a pea to a marble; I have one now before me, which appears to be of the same substance as the shell—it will not scratch glass. In 'Wild Sports of the World,' by Greenwood, p. 324, speaking of these calculi or concretions of shell, he gives the following:—"I find Barrow says, these are pale yellow, in one egg we found nine, in another twelve." Thunberg says: "A stone is sometimes found, hard, white, flat and smooth, about the size of a bean; they are sometimes cut and made into buttons." The substance in my egg appears very like one of the above; but I hesitate to satisfy my curiosity, to do which I must bore a hole in a specimen at present in the most perfect condition, and as regards England unique. * * *

Perhaps the Madagascar bird, which was probably polygamous, had the habit of scattering eggs all over the country, as does the Rhea and also the ostrich. Darwin says of the former: "In the months of September and October, the eggs in great numbers lie, either scattered or single, all over the country." If this was the case with the species of which we are treating, the four eggs obtained would most likely be solitary ones, and a full nest of Æpyornis maximus may yet be discovered, particularly as the immense strength of the shell appears to defy time. But bones are our chief desiderata: these will probably turn up in some bog or banks of a river. Rheas were seen by Mr. Darwin swimming across the Santa Cruz River where it was four hundred yards wide, with a rapid stream. Sturt came upon two emeus in the same way in the Murrurbridge in Australia, and one of the great eggs was at least washed out by a stream. Bones of the New Zealand giant were found in a morass, and in such a situation I should search in Madagascar.

It is strange that so colossal a creature could have lived in modern days and yet escape notice. M. Geoffroy Saint-Hilaire, quoting Mr. Strickland ('Annals of Natural History,' No. 23, November, 1849, p. 338), states that M. Dumarele, a French merchant, sent an account of an enormous egg, in 1848, to M. Joliff, surgeon of the "Geyser." This was seen by him in Madagascar at Port Leven, but he could not buy it of the natives, as it belonged to a chief of the Sakalawas tribe, and on account of its rarity was held in great estimation by them. Most likely M. Dumarele's specimen is one of those in Paris.

Perhaps the bird, though probably now extinct, has not been so more than two hundred years, as some of the cartilages, according to the French account received by me with the egg, were still adhering to the bones when found. The condition of the shell, perhaps, can hardly be called semi-fossil: it is said to be three times the thickness of the ostrich's. Of all the bones in a bird, we could scarcely have selected one more valuable than the metatarsal to Science, as indicative of fixed ornithological laws, which is so far most fortunate. * * *

Just as this paper was going to the press, my attention was called to Mr. Strickland's translation of M. J. G. Saint-Hilaire's pamphlet, in 'Annals and Magazine of Natural History,' 2nd Series, No. 39, March, 1851, p. 161, and also Professor Owen's remarks upon the same subject, in the above periodical, No. 75, March, 1854, p. 229. Neither of these papers had I seen, nor was I previously aware of their existence. I therefore append a portion of Professor Owen's valuable remarks. He gives the following admeasurements of the Paris eggs:—

	Ovoid egg.			Ellipsoid egg.		
	ft.	in.	lin.	ft.	in.	lin.
Greatest circumference lengthwise . .	2	10	9	2	9	6
Breadthwise	2	4	3	2	5	6
Extreme length in a straight line . .	1	0	8	1	0	5

"The portions of bones, of which casts were exhibited" (at the Zoological Society), "consist of the lower end of the right and left metatarsal bones and the upper end of the right fibula. These are nearly equal in size to the corresponding parts of the skeleton of the Dinornis. * * *

"In neither the Dinornis nor the Æpyornis is the metatarsus perforated, as in Casuarius and many other birds, above the interspace between the outer condyles: that interspace is simply deeper, or curved higher in both. The outer trochlea, which is entire in both portions of the metatarsi in Æpyornis, is, in a marked degree, smaller than in Dinornis, as is also the inner trochlea, as far as one may judge from the posterior part which is preserved. The interspaces of the trochleæ are wider posteriorly in Æpyornis, and the outer one is more angular at its upper end. The middle portion of the posterior surface of the lower third of the shaft of the metatarse in Æpyornis is more produced than in Dinornis, and a ridge is continued from it to each lateral trochlea, dividing the back part of the shaft above them into three surfaces; whereas the corresponding surface in Dinornis is simply flat from side to side. Above this part in Æpyornis the posterior surface on each side of the middle prominence is concave, and meets the anterior surface at a ridge which is narrowest at the outer border of the bone. In Dinornis both borders of the lower third of the shaft are thick and rounded.

"The Æpyornis does not show any trace of the rough tract for attachment of a back toe, as in the Palapteryx robustus; in this respect it resembles the Dinornis. At six inches from the lower end the shaft begins to be concave along the middle of the fore part, the concavity deepening as it ascends; whereas in Dinornis the anterior median concavity of the shaft does not begin to appear until above the upper half of the bone. In this character the Æpyornis resembles the cassowary; but it differs from the cassowary in the much narrower or sharper lateral margins of the shaft of the metatarsus. Like the cassowary, however, the breadth of the shaft is greater in proportion to that of the trochlea than in the Dinornis or Palapteryx.

"It would be hazardous to conclude as to the length of the entire metatarse from the breadth of the distal end; for this is equal in Dinornis giganteus and Palapteryx robustus, whilst the length of the metatarse is 1 foot 6 inches in the one, and 1 foot four inches in the other. I think it more probable, however, that Æpyornis had a shorter rather than a longer metatarse than the Dinornis giganteus.

"That its leg-bones were smaller is significantly indicated by the difference of size in the fibulæ.

	Dinornis. ft. in.	Æpyornis. ft. in.
Longest diameter of the upper end . .	2 11	2 9
Shortest diameter of the upper end . .	1 4	1 0

"This bone in Æpyornis shows a flat, full, oval articular facet on its tibial side, of which there is no trace in Dinornis.

"Upon the whole, therefore, Professor Owen concluded that the Æpyornis maximus did not surpass in height or size the Dinornis giganteus, and that it was more probably a somewhat smaller bird.

"The fragments of the egg of Dinornis or Palapteryx—of what species of course cannot be determined—show, after arriving approximately at their size by a curve of the fragments, that the shell was not only absolutely thinner, but relatively much thinner than in the ostrich, and *à fortiori* than in the Æpyornis. The air-pores, also, have a different form, being linear not rounded, and the external surface is smoother.

"In the smoothness and thinness of the shell, the egg of the Dinornis resembles that of the Apteryx; in the thickness of the shell and the comparative roughness of its exterior, the egg of the Æpyornis more resembles that of the ostrich and cassowary.

"It is most probable that the entire eggs of the Æpyornis were excluded in the usual fertile state, but had suffered such want or interruption of the usual heat requisite for their incubation as to have become addled."

The Recent Moa.

At the meeting of the Linnean Society of London, held on the 17th of June, my friend Thomas Allis, F.L.S., and Vice-President of the Yorkshire Philosophical Society, exhibited some of the bones of the moa, together with two beautiful photographs by Monkhouse and Co., of Pendall, York, and read a paper descriptive of the bones, and the circumstances under which they were found, including suggestions as to their probable age. The first plate exhibited the following bones:—the sacrum, three vertebræ, normally anchylosed, and having the left ribs attached; one other vertebra with attached rib; the sternum with its second and third right ribs, and its second left rib still attached; a fibula with a portion of the outer skin still attached; the left inner toe, with the sole still adhering, and a portion of the sole of the foot also attached; the head, which is perfect with the exception of the left zygomatic bone. The second plate presented an outer view of the sacrum covered with skin which is dotted over with the quill-points of feathers; a femur having a portion of flexible cartilage still *in situ;* the anterior margin of the sternum showing the fossæ within which are contained the articulory surfaces for the attachment of the wing-bones; the tarsus; the head as seen from below, showing the absence of the left zygomatic bone; and the lower mandible. The following bones were wanted to make the skeleton complete: the left zygomatic, the atlas, two, three, or more cervical vertebræ, the first pair of dorsal ribs, the first pair of sternal ribs, one of the wing-bones, and the middle left toe. The skeleton was found by gold-diggers, near Dunedin, in the middle island of New Zealand, under a deposit of shifting sand, and the bird had been surprised whilst sitting on its young ones, the bones of which were exhibited with those of the parent.

A long discussion, in which Professor Busk, Professor Huxley, Dr. Hooker, Henry Deane and others took part, followed the reading of the paper. Dr. Hooker suggested that the perfect condition and high state of preservation which the bones exhibited, might possibly be the result of preservation in ice, similar instances being on record, especially that of the Siberian Mammoth, in which even the flesh was preserved; but the other speakers took an entirely different view of the subject, and thought that the bird to which these enormous bones belonged had probably been living within ten years. If this conclusion be correct, it seems extraordinary that no more precise information can be obtained from the natives, a race remarkable for their intelligence; for, if so gigantic a creature were living ten years ago, it seems impossible that no more accurate information respecting it should exist, than the vague and most unsatisfactory reports which have been collected by English emigrants. However, a very important point is settled in bringing the history of the bird down to the time when New Zealand was colonized by the British: it were indeed presumptuous to affirm that a moa will still be found alive; but the evidence now before us shows that such an event is anything but impossible. In considering this subject, we must bear in mind that, being continually at war with the natives, we are debarred from that free access to the interior and from that unrestrained exploration which are absolutely necessary in such a case as this. The wary character of the ostrich tribe is well known: in the Great Sahara the ostrich himself is only to be discovered at an immense distance, and yet there are no intervening objects behind which he could shelter: it is very different in New Zealand: there the moa, if possessed of half the subtlety of the ostrich, might escape for years the notice of the few Europeans who have ventured to intrude on his haunts.

Notice of the Remains of the Moa and other Birds formerly inhabiting New Zealand. By WALTER BULLER, Esq.*

ON seeing the extraordinary and marvellous accounts in the New Zealand papers regarding the discovery of the moa, and which were republished here, I wrote to my brother, the Archdeacon of Wellington, for information; and he has by this mail forwarded a paper written by an ornithological friend, in which I find my opinion (as communicated at the time to the Editor of the 'Zoologist') respecting the non-existence of the moa corroborated by a naturalist of some standing and experience in the colony,—one, too, who it will be readily seen, has devoted much time and attention to the subject, and whose valuable remarks I am privileged to make use of, and therefore send for publication in the 'Zoologist.'

HENRY HADFIELD.

Ventnor, Isle of Wight,
June 22, 1864.

From Walter Buller, Esq., to Archdeacon Hadfield.

March 17, 1864.

My dear Archdeacon,—With regard to your query respecting the moa, I fear I can tell you little or nothing that is new. As to whether it is still in the "land of the living" is, to my mind, a settled question. Like the Irish elk, mastodon and mammoth, the moa belongs to a *past* generation of colossal beings, although of course its extinction is of far more recent date. Nothing now remains to us of the moa but the extensive bone deposits in various parts of the islands, and the rude history of the bird as preserved in Maori tradition. That the Dinornis was contemporary with the Maori in New Zealand is sufficiently established by the fact that broken and calcined moa-bones are not unfrequently found associated in the same heap with the usual refuse of Maori feasts of that period—human bones, fish bones, shells, &c.; and if it be admitted that the first Maori emigrants arrived in the country about five hundred years ago, we bring the extermination of the species down to a comparitively recent date. To talk of a gigantic moa turning up with future explorations seems to me mere idle speculation.

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* Communicated by Captain Henry Hadfield.

The whole of the North Island has now been explored, at any rate sufficiently for the purpose, and the general character of the half-explored West-coast regions of the Middle Island,—rough, mountainous and wooded,—blights all hope of moa discovery in *that* direction.

But I must qualify what I have said by explaining that by "moa" I mean the Dinornis, of which there appear to have been at least six species (D. robustus, D. dromioides, D. rheides, D. struthioides, D. curtus and D. didiformis). The natives applied the name "moa" indiscriminately not only to these but to several other species of smaller stature and belonging to genera altogether distinct. The Notornis and the Apteryx they distinguish as the "molio" and "kiwi," but the three other ascertained genera, Palapteryx, Brachypteryx and Aptornis were all "moas" with the Maories.

The Palapteryx (of which more presently) was a brevi-pennate bird, resembling in its principal characters the emeu of Australia, and standing about seven or eight feet high. The Brachypteryx is described as a gigantic short-winged rail; and the Aptornis as equalling in size the great bustard (*Otis tarda*), to which, in its osteological structure, it has some affinity.

Now, it is not only possible but highly probable that some of these smaller struthious birds still inhabit the solitudes of the Middle Island and the unexplored forests of the North. Their remains have been found mixed with those of the "moa" (proper) in the menaccanite-sand deposits of Waiugougoro, and in the moa-beds of Waikouaiti. Those from Waiugougoro especially are in a high state of preservation, owing probably to the character of the sediment in which they lie embedded: these bones have been interpreted and classified, with wonderful sagacity, by Professor Owen. Brachypteryx remains are scarce, and, compared with Dinornis, Palapteryx remains are very local in their distribution. Not long ago, however, I found in a sand-hill, a few miles up the Manawatu River, a small bone which I marked "Palapteryx?" and sent in to Mantell for examination. He confirms my opinion. If we are right in the conjecture, the discovery is an important one. Aptornis bones are common enough, I think, in the Middle Island, but only a few imperfect specimens (so far as I am aware) have found their way to Europe. Owen originally mistook the bones of Aptornis for those of a Dinornis, naming the supposed new species Dinornis Otidiformis. Dr. Mantell was the first to point out the distinct generic characters.

But to return again from the dry ossiferous remains to the living bird. The discovery by Walter Mantell, in 1850, of a live Notornis, of which the generic characters had long before been determined by Prof. Owen from an examination of the Waiugongoro fossils, while it proved the soundness of the Professor's physiological inferences, established at the same time the fact that the Waiugougoro collection represented the living as well as the dead. Dr. Mantell speculated a good deal on his son having secured to Science "the last of a dying race," but another live Notornis was afterwards taken, and the skin is now in the British Museum.

Again, the smaller representatives of the tribe,—the Apteryx, of which there are at least three existing species (A. australis, A. Owenii and A. Mantelli); the woodhen (*Rallus australis*), which is the true type of the Brachypteryx; the Porphyrio and the small short-winged "swamp rails,"—are still comparatively plentiful in the remote parts of the country. Apterous birds must of necessity disappear before such enemies as the wild dog and cat, and, were there no other cause in operation to check its existence, the kiwi would ultimately become extinct. A few years hence and an Apteryx will probably be as great a rarity as a live Notornis! Nevertheless the kiwi does exist in the land now, and that is sufficient for our argument. May not Palapteryx, Brachypteryx and Aptornis, all or some of them, still inhabit the unfrequented parts of the interior? I think we have some evidence presumptive of the fact:—

1. Mr. Mantell tells me that Watts Russell, in his West-coast journey in the Nelson Province, a few years ago, killed and innocently ate (!) a bird which he described as resembling a Rhea or cassowary. Was it not a Palapteryx?

2. The Middle Island natives speak positively of a huge wood-hen, which they call "takahe," as still frequenting the broken mountainous country at the extreme south. May not this be a Brachypteryx?

3. Sir George Grey, when he was last here, told me that Tamati Waaka had gravely assured him that a "moa," standing about four feet high, was still occasionally met with in the wooded country near the Bay of Islands. When the Governor affected to doubt his word, the old man got angry, and said he would prove it by bringing one, some day, to Government House!

4. Mr. Rochfort, the Provincial Surveyor of Nelson, describes (in the 'Nelson Examiner,' August 24, 1859) a bird which he had seen in the Paparoa Elevation as "a kiwi, about the size of a turkey, having spurs on his feet, which, when attacked by a dog, defends himself so

well as frequently to come off victorious." The natives call this bird "roa," and Professor Hochstetter has proposed to name it Apteryx maxima; and, lastly,—

5. Dr. Haast, who is now exploring the alpine region of the Middle Island, writing to me, under date, July 26, 1862, says, "I believe I have convincing oracular proof that in those never-before-trodden alpine forests (Canterbury Province) exists a *very large* kiwi, the existence of which till at present was quite unknown. I have heard many times the roa, the large kiwi of the west coast, but his call is like the cry of a baby to the voice of a powerful man when compared to the call which we heard in the Alps, while camping near the edge of an extensive forest. * * * It was towards midnight, and although fast asleep we were all awakened by this enormously loud call." Was not this, think you, the scream of a veritable Palapteryx?

Yours faithfully,

WALTER BULLER.

Acclimation and Breeding of Emeus (Dromius irroratus, *Bartlett*) *in Surrey.* Chapter II. By WILLIAM BENNETT, Esq.

I LEFT my young emeus (Zool. 8323) just parted from their affectionate father, and not yet fully reconciled to beginning the world on their own account. The sense of deprivation gradually wore off, and occasionally they were indulged with an interchange of visits, in order to keep up acquaintanceship and mutual interest. During the winter they had each a severe illness, one following the other. My friend John Steele, one of our ablest medical practitioners of Reigate, and a warm naturalist, hearing of their indisposition, called professionally. On examination of the symptoms, apprehending it was the liver that was affected, probably by the difference of our climate, he prescribed one-grain calomel pills, to be given every third day, followed by a gentle aperient. They were very difficult patients to administer anything to. Somehow, however, this was managed for a fortnight, and they both recovered, after one had been entirely given over. They are now grown fine birds, nearly as tall as their parents, but not, I think, mature for another season at least. The two are very different in their bearing and manners, one being much higher spirited and less tractable than the other; but both have for some months began to put on the *boom*, the peculiar indication of the female bird, though one is much more distinctly pronounced than the other, and it is exceedingly difficult to determine the sexes, until quite mature. They likewise had a severe quarrel, lasting for nearly a month, in the spring, which looks like jealousy, but perhaps it was only to establish supremacy, for they are now entirely at peace. The two from the same stock of the preceding season, in the Zoological Gardens, Regent's Park, have thriven well, are now considered to have arrived at maturity, and are pronounced both males. My adult birds became reconciled to each other in due course.

The next season (1863) was most prolific in eggs, but proved an entire failure as to any further result. The laying commenced on the 2nd of January. There was an interval of four days between each of the three following eggs, and then the process continued with the utmost regularity, on every third day, even to the time of the afternoon. It was invariably within a margin of one hour on either side of four o'clock that an egg was deposited, up to the twentieth in number (see "Diary," Zool. 8494). I had learned to interpret the voice of the bird, namely, a low muttering sound she regularly makes for an hour or so before laying, which rendered the observation of the time a matter of but little difficulty, whenever I was at home. The same precautions were taken with respect to the safety of the eggs from frost as the previous season. After this number of eggs had been laid, the male bird exhibited the usual symptoms, and he was set upon thirteen eggs on the 5th of March.

The early period of sitting was as close as before. The first view obtained of the contents of the nest was on the 9th, when two more eggs were found to have been added. The bird at large was seen to deposit another on the 12th. It was the 21st before another view of the nest was obtained. There were then seventeen eggs in it. Three were removed, under the idea that there would still be as many as the bird could do justice to. An incubator was started for the reception of the surplus eggs.

The bird at large continued to lay until the enormous number of twenty-eight was completed. From the average known weight of the bulk of them, it must have amounted to about 40 lbs. in all.

The management of the incubator was conducted exactly, as recommended at the Zoological Gardens, as nearly as circumstances admitted, except that the average temperature aimed at being maintained was 104° instead of 108°. All my subsequent observations lead me to conclude that the former may be somewhat too high. During the first four weeks everything went on admirably. In the fifth week I was summoned from home by the illness of a near relative. Though only absent a day or two, a source of disturbance occurred which I did not know of till afterwards. Nothing amiss with the sitting bird was detected on my return. Early on the afternoon of the day following, however, I found the bird off the nest, and wandering about, to my great dismay, in a state of the utmost excitement. Nothing could reconcile him, or attract him back again to the nest. After some inquiry I learned that a pleasure-boat had just gone up the river,—a privilege we by no means wish to deny our neighbours up or down our sullen, but attractive and sylvan little stream,—and that previously, in the week, the same or another boat had landed some of the party, to notice the birds, during my absence from home. The sight of strangers, especially ladies in black, or with flying gay ribands, or loud voices, or unaccustomed noises of any kind, always greatly disturbs and excites them. But it was the plash and sound of the skulls in rowing that I believe was the great cause of offence. I have since noticed that the beating of a carpet or a drum, anywhere within hearing in the neighbourhood, greatly distresses them; and I have now no doubt it was a boat coming up the river that Sunday morning that was the unknown and mysterious cause of disturbance on the first occasion (see Zool. 8319). I had ample evidence that the sight or sound of a boat is something of which these birds have a remarkable dread or antipathy to, when, on going my round two or three days afterwards, I again found the two young emeus, then a year old, in a state of the greatest anger and alarm, with flaming eyes and mouths open, one of them having leaped the fence in its terror. On looking round for the cause, *there was the boat*, having just landed opposite their inclosure,—come to make an apology,—the lady and gentleman having heard of the unfortunate disturbance!

My poor sitting emeu—that was! Everything I could think of to quiet and console him, and attract him back again to the nest, was persevered in till hopeless. All the more likely eggs were then removed to the incubator. As I anticipated, the bird sat again that night, and the bulk of the eggs were restored. I clung to the hope that he would forgive and forget the offence, and resume the sitting, though, from certain symptoms observed, I was not very sanguine. My first visit in the morning satisfied me it was all over. The bird was off the nest, and chafing violently against the railed door of the house, which had been shut that night for safety. The eggs were returned to the incubator.

No accident that need have been fatal to the successful hatching out of at least some of the eggs happened, as far as I am aware of, to the incubator. Some ordinary chickens were hatched in it during the process. But two months is a long time to keep up the normal conditions; and many little delicate handlings of Nature repeatedly wanting, may tell. Various eggs, one after another, gave undoubted signs of being addled, and were removed; and all, but not till after they were much overdue, were eventually given up. I tried to console myself with the thought that perhaps the whole batch, this season, might be barren eggs, and thus afford a possible reason why the bird was the more readily disturbed. Experience has since showed that the reason would have failed had the fact proved so. All my disappointment and mortification returned in full, when, on preparing the eggs for specimens, by emptying the contents, I found, altogether, a large number of embryo chicks, in various stages of development,—several with beak, claws and plumage complete,—apparently just ready to break through the shell! The process must, therefore, have gone on properly in the incubator, very nearly to maturity; but I very much doubt, from subsequent experience, whether any of these, if healthily hatched, could have had strength to have been healthily reared.

I think I may say my adult birds continue to improve in manners and plumage every year, so far. The first egg this season was dropped on the 23rd of December, 1863, as usual, in the first place, down by the water side. Another was not found till nine days afterwards, namely, on New Year's Day, and the third not till the 12th of the month. One, however, was subsequently found, down by the water, in a dirty condition, that had evidently been long laid, which probably intervened, and possibly more than one may have been lost. The two next eggs occupied four days each, and then the laying proceeded every third day, with the accustomed regularity, and the observance of the average time of four o'clock in the afternoon. The total number laid this season does not nearly reach to last; but they have annually increased in size, several this year weighing over 1½ lb. It is very curious the bird, in sitting, kept the precise anniversary of the year before last, namely, St. Valentine's Day, the 14th of February. The number of eggs he was settled upon, in the first place, was ten. Extra precautions had this year been taken to shut out any unusual sight or sound, and promote perfect quiet, by the erection of a double screen of evergreens before the house, and a bar was respectfully placed on the proprietors of boats, not to pass beyond a certain point for the necessary period.

The bird sat, if possible, more closely than usual; so much so, that a sight was not obtained of the nest till the expiration of the fourth week. It was then found to contain fifteen eggs, so that five had, during the time, been laid into it. As heretofore, the bird, after this period, became much more restless. The eggs had been marked on previous occasions, so as to endeavour to learn their individual history, but the markings had not proved permanent. This year a pigment of copal varnish and vermilion was employed, and each egg, as laid, conspicuously numbered in two places, which proved effective. In the sixth week the last laid egg was found turned out of the nest; and, as they had not always been well covered, it was not replaced. Early in the seventh week an experiment was tried on one of the eggs, in the usual way, with hot water, and it showed manifest signs of life; and the hen bird was now shut off for fear of disturbance. On the 6th of April an egg was found laid just outside the house, because she could not get in! The closing day of the eighth week the sitting bird was most uncomfortably restless throughout, and gave me much anxiety about the result, but settled again towards night. The first thing next morning I found an egg turned right out, and being a slope had rolled a considerable distance. It was stone-cold: I brought it in, however, and thought we would just try it with hot water. To our wonder and admiration it kicked—that is, the chick within it—most vigorously! Of course it was instantly replaced under the bird. The following morning *the same egg* was again found rolled out of the nest, but not to so great a distance, and it had not become so cold. What could this mean? It was again treated with hot water, and not only manifestly moved with increased strength, but a distinct *chirp* was heard inside! Again, on the next morning, three more eggs, all differing in their number to the previous one, were turned out and exposed; so it was not any particular antipathy to that unfortunate egg. They were all tried, and showed ample signs of life, and upon being placed close to the ear a strong internal movement, like fermentation, was distinctly perceptible. They were all immediately replaced. On the next morning, April 13th, the first young emeu was hatched out, to our great delight: it was No. 13, the identical egg that had been twice dislodged from the nest, and once was taken up so deathlike cold! On the 14th Nos. 12 and 10 hatched out, and on the 15th Nos. 5, 11 and 7.

On the morning of the 16th a death was found to have occurred in the night. It was not one of the last three, and there was no apparent cause. I am strongly inclined to suspect it was poor unfortunate No. 13, a large strong chick to all appearances, but perhaps died from inflammation or a cold caught in the egg, from that night's exposure.

It was replaced, however, by No. 8 being hatched in the course of the day.

The day following was a day of rest. The next morning produced another, an unnumbered egg, being the first, no doubt, of the additional ones laid into the nest. The three remaining of the original numbered eggs, were now tried, found to be lifeless, and removed.

There were still three left of the additional more recently laid eggs, which would each require the corresponding multiple of at least three days for the normal time of hatching. Two of these exhibited unmistakeable signs of life, and one distinctly chirped.

The bird, with his large family about him, was now naturally very much off the nest by day. The two living eggs were therefore brought away, and exposed to the full sun (ranging from 100° to 118°) whenever it served, or kept by the fire at something over 100°, and put under the bird at night. The more forward of the above two was safely hatched on the 22nd. The other one progressed in strength daily; was heard to chirp four days beforehand, but did not begin to break out of the shell till the 28th. It was nineteen hours in completely extricating itself, and that not without some assistance from its parent, and even from its active elder brothers and sisters, to the eminent peril, apparently, of its poor little life. It was not healthily hatched, though it grew and gained in strength for several days. It had one foot cramped from the first, and, being once fed (forced with food), never took anything of its own accord. Over-heating is almost an invariable cause of weakness and cramp, and I think it had probably too much before the fire. It had to be nursed almost entirely in-doors, and during its short life became evidently much attached to those about it. Though it could only hobble at best, it would follow me when doing little matters in the sunshine about the garden, and would utter the familiar plaintive cry when I was long out of sight. It was always put back to its parent at night, and was found crushed in the nest on the morning of the 8th, aged ten days. The remaining egg was finally abandoned. Thus a brood of ten young emeus have been hatched this season altogether. One other misfortune I have to record. On returning home late from a necessary day's absence, and proceeding at once, as usual, to the emeu-house, I found one fine strong little one, the second in age I believe, stretched lifeless on the ground, from an accident, I apprehend, that further experience may avoid. The remaining seven are thriving well, grow fast, all but one appear quite healthy, and they form a most lively and interesting family. A trying period comes on at about four months of age.

It was found necessary to separate the mother bird as before, or the young ones being let out. The parents spar occasionally across the fence when anything occurs to excite them. *He* is most gentle and attentive to the little ones, and steps about amongst them with the most admirable care. Let, however, a strange dog or cat, or other supposed enemy, make its appearance, and the scene is absolutely sublime. *She* is in full sight of them, and struts about with a full pouting breast of feathers, and evident satisfaction, like a great turkey-cock. The young ones, instead of the ashy brown adult plumage, are elegantly longitudinally striped, their heads very prettily dappled; they are anything but shy, feeding freely out of the hand, and are very playful, imitating all the odd actions of the parent birds.

I draw the following conclusions, in addition to, or correction of, former observations as to the habits of these singular birds:—

1. The normal period of incubation is about sixty days.

2. The number hatched in the natural state is probably very small, though the number of eggs is so large. The eggs are probably laid about, with an affection for sheltered damp places, and when the breeding time comes the male bird gathers together the few he can find, sits upon them steadily for a month, becomes restless as soon as he feels life in them, perhaps very much exposes them to the sun for the last fortnight, and, when two or three are hatched, walks off with them away from the mother bird, leaving the rest to perish.

3. The principle of life is remarkably strong in the young bird, both while an embryo in the egg and afterwards.

It would not be right to omit acknowledging the extreme attention and active liberality of the Société Imperiale D'Acclimatation of Paris, who, through their Secretary, M. Pierre Pichot, have, in the most gratifying manner, awarded me their first-class honorary silver medal, for success so far, before the present season, in the propagation of the emeu. The medal has been duly received through the kind offices of the Acclimatisation Society of London.

Wm. Bennett.

Brockham Lodge, June 4, 1864.

Eagles in the Highlands.— On the 4th of the present month (June), when fishing on Loch Tummel, Perthshire, my son saw an eagle take a fish (of about two lbs. weight apparently) from the surface of the water. From the white tail my son concluded that the bird was a sea eagle, or erne; but he tells me that owing to the distance (some 150 yards) he could not be sure that the tail was wholly white, and not tipped with a dark band, as in the immature golden eagle. The body appeared to be dark brown, with some white about the head. The fish was taken with the talons. A few days afterwards, when fishing in Loch Ericht (to the north-west of Loch Rannoch), my son saw an eagle settle on a high crag, on which, he was told, eagles still breed. In 1862 an acquaintance of mine saw, and narrowly missed shooting, an eagle on the high moors a little to the west of Schiehallien. Last season another friend of mine was, with his gilly, early one morning, waiting for deer in Glen Morrison, when an eagle swooped down from the neighbouring mountains, flew round them in diminishing circles, and came at last so close as sorely to try my friend's forbearance, when the gilly made some movement, and the bird was off like a flash of lightning. I cannot vouch for the ornithological knowledge of my two friends, but the first of them believed his bird to be the golden eagle. The Trosach's Hotel and the Invergarry Inn, in Glengarry, each contains (or did contain a very few years ago) a stuffed eagle, killed in the neigbourhood not long before, and both these birds are immature golden eagles. There is no mistaking the feet and the feathered legs. From all I have seen, heard and read on the subject, I believe that the golden eagle is the common eagle of the inland districts of the Highlands, although the erne may be more numerous in the maritime parts. Blue hares were, and no doubt still are, very abundant on Schiehallien and the neighbouring hills; and if they are, as is most probable, equally abundant in many other parts of the Highlands, the annual destruction of lambs by the few eagles now remaining in Scotland can scarcely be large. I suppose the grouse-shooter in Scotland considers the blue hare as great a nuisance as the game-preserver in England does the rabbit, and if left for the eagles the lambs may escape. — *Henry Hussey; The Deanery, Peterborough, June* 20, 1864.

Osprey near Beverley.—A most beautiful old female specimen of the osprey (*Falco haliaëtus*) was shot within a few miles of Beverley, by Mr. Kemp, gamekeeper, of Skerne, on the 4th of May, 1864. The bird was shot nearer to Driffield than to Beverley, but still only about twelve miles from the latter town. It had no doubt been feeding on trout taken from the far-famed stream that runs close to the town of Driffield, so well known to most followers of the gentle art. Never having previously seen a specimen of the osprey in the flesh, I was naturally enough delighted to have an opportunity of dissecting one, and this I was enabled to do by the purchase of the fine specimen above recorded, which has since been beautifully mounted by our able taxidermist, Mr. R. Richardson, of Beverley. Referring to my notes taken at the time of the dissection, I find jotted down the following remarks. "The bird presents perhaps the most marvellous combination of concentrated power and activity I ever beheld in a form of flesh and blood, measuring 2 feet from tip of bill to tip of tail; its huge wings rather exceed 5 feet 5 inches in their span. Whether we consider the development of the bones, with their ridges and processes for the attachment of those muscles called into play during flight,—the enormous power of the muscles themselves, when compared with the same muscles in other birds,—or the primary feathers of those wonderful organs of locomotion, that rival the whirlwind in their proportionate powers and speed,—we find subject, indeed, for wonder and admiration—evidence most striking of the surpassing design and wisdom of that great Creator who has fashioned all these beautiful objects of Nature, and supplied them so bountifully with the means of enjoyment and usefulness in life. The greatest concentration of power in this bird is to be found in the leg and foot, whose resistless force and grasp may to a certain degree be appreciated by an endeavour to prize open the talons within several hours after death,—which, in the act of death, had been spasmodically flexed upon themselves. This cannot be accomplished without first severing across the tendons of those muscles that in life endow the talons with their enormous prehensile power. The talons laid back or extended from the sole of the foot, we find the under surface of each toe and the sole or ball of the foot itself clothed with a cuticle so rough and horny, in texture and arrangement, that it more resembles a file than any organic structure, each separate epithelial particle being drawn out to a rigid, tooth-like point. This roughened palm and resistless grasp enables the osprey to hold with ease the slippery prey on which it feeds, and, without apparent effort, to set its struggles at defiance even during flight. The shank of the leg is shorter and at the same time thicker, in proportion to the size of the bird, than in any other species of the great falcon family. This, too, lends power to the limb, and, as the skin and fibrous expansion that binds the tendons in their places are also immensely thickened and strong, the whole arrangement presents one of the most striking examples of concentrated strength, and perfect aptitude for its appointed offices, that we can meet with in creation. The unusual mobility and length of the outer toe also, which can voluntarily be advanced or drawn backwards, adds still further to the prehensile power of the member. The grasp of this outer toe is much increased by its unusual relative length, which is not far short of the middle toe, the proportion being as follows, *viz.*, middle toe, 1¾ inch; outer toe, 1¼ inch. The general condition of the bird was unusually good for a bird of prey whose body generally appears rather muscular and lean than fat. This specimen must have lived in clover, and fed leisurely for some time, as it was both muscular and fat. Dissection proved the sex female, and one fully mature; but although this is about the nesting time of the osprey, and several of the ova were as large as good-sized peas, no other bird of the species has been observed in the neighbourhood, in spite of a very sharp look-out I have established, in order to detect the male in case that my specimen had been paired. The crop of this female osprey was distended with food. This seemed to be chiefly the soft parts of fresh-water fish, mixed up with a few bones, apparently swallowed inadvertently with the soft parts, rather than as food, or to serve any other purpose in the process of digestion. From the pulpy state of the fish in the crop shortly after death, I should suppose that organ to be endowed with glands secreting a fluid which possesses a certain solvent effect on the food lodged within its cavity. This is, however, merely a supposition on my part, arising simply from the condition of the contents of the crop as I observed them. This bird cannot have fed very long before it was shot, which probably accounts for the peculiar manner of its flight. The man who shot it states that it was flying about twenty feet from the earth, certainly not more, when he shot it. The food at the time of death was in the act of passing from the crop to the stomach: the ventriculus succenturiatus and first portion of the stomach had become nearly filled with matters precisely similar to those found in the crop, and in an exactly similar condition as to their consistency. The stomach itself was peculiar, being somewhat similar to that of the smew, goosander, &c. (all fish-eating birds), but curiously enough exhibiting the order of its parts reversed, *viz.*, the thicker or more muscular portion attached to the ventriculus succenturiatus and œsophagus instead of to the bowel, and the purely digesting, thin, almost transparent portion attached to the bowel instead of to the gullet, &c. Why this reversal of parts it is difficult to surmise, unless indeed it be to insure a more perfect solution of the food previous to its being passed onwards for the purposes of assimilation. The food, first pulped thoroughly by the combined action of solvent fluids and mechanical muscular force, is lastly subjected to the action of more perfect solvents, which complete the softening process so rapidly as to admit of the food being directly applied to its ultimate end on passing from the stomach. The osprey, whose powerful muscles and active habits, under various circumstances, require great and frequent sources of restoration, needs a more rapid and perfect digestive process than those other fish-eating birds which continually dwell on the watery element, and whose powers of flight and endurance are not so constantly and severely taxed. The intestine was no less than 12 feet 4 inches in length (good measurement). I have preserved the stomach in spirits of wine, and intend making a series of preparations of the stomachs of various species of birds, for the purpose of comparison, &c.— *W. W. Boulton ; Beverley, May* 20, 1864.

Peregrine Falcon at Flamborough.— I have this day (May 20) received a splendid and unusually large specimen of the peregrine falcon, in the flesh. It was shot close to Flamborough, by Thomas Long, of that place, on the 18th instant. Dissection proved it to be a mature female. The stomach contained the remains of a rock pigeon, which included, amongst other portions of the bird, one entire foot and shank, and a few feathers. An old male bird, which had probably been paired to my specimen, has been seen in the neighbourhood of Flamborough since mine was shot, but hitherto it has escaped capture.—*Id.*

Peregrine Falcons taken at Beachy Head and Seaford Cliffs. — I have just seen three fine young peregrines, taken at the above places about a fortnight since, by Mr. Collins, of Meads, Eastbourne. Four were taken from a nest in the Seaford Cliffs, and three from one in the high cliff between Beachy Head and the Lighthouse. Six have been purchased at £1 each.—*J. Dutton ; Eastbourne, June* 11, 1864.

Montagu's Harrier near Weston-super-Mare. — The beginning of this month a fine female Montagu's harrier was trapped upon Brean Down, about two miles to the west of this place.—*M. A. Mathews ; Weston-super-Mare, June* 10, 1864.

Redwing Singing in England. — Several times it has been my fortune to hear the song of the redwing. Indeed I never thought that it was at all unusual for the redwing to sing here before it left in the spring, and so, on the occasions when I heard it, I had not considered it a circumstance worthy of particular note. On fine sunny mornings in March I have often, in North Devon, heard the redwing singing from the top of some tall hedgerow tree. I am quite certain that it *was* a redwing on each occasion, as I not only plainly distinguished the bird, but also was attracted to look upwards in order to discover whence a sweet, soft song, which was new to me, proceeded.—*Id.*

Redwing Singing in England.—I have just returned home, after passing the winter in the sunny South, and on reading up the last six numbers of the 'Zoologist,' which have accumulated during my absence, I am surprised to see so much doubt cast upon the accuracy of a statement made by the Rev. A. Matthews respecting the singing of the redwing in England. Granted that it is not the *usual* habit of this bird to favour us with much of its song during the cold months of winter, when alone we have an opportunity of observing it ; yet when we recollect the high character as a first-rate songster which it bears in its own native country, and the great reputation it has there for melody, sweetness and power of voice, and that of so high a class as to have procured it the *soubriquet* of the " Swedish Nightingale," I think it is not unreasonable to conjecture that on occasions—such as the mildness of the weather, the bright sun, or other favourable circumstances may call forth—the redwing will indulge us with a specimen of its rich and powerful song, wherewith it notoriously is wont to gladden the hearts of Scandinavians during their bright and nightless summer. That it does occasionally so honour us the assurance of so excellent an ornithologist as Mr. Matthews convinces me, though the occurrence may possibly be infrequent, and so may escape the notice even of careful observers. But I apprehend that there are many facts yet to learn with regard to the song and habits of even our commonest birds, and that on the part of those who have watched them for years; at least so my own experience assures me, for I am continually finding out new traits, and discovering peculiarities hitherto unnoticed even in those species which frequent my own garden, and with which I thought myself most familiar; and so I shrewdly suspect it will be to the very end of the chapter, for of Natural History it may be said, perhaps more truly than of anything else, "There are more things in heaven and earth, Horatio, than are dreamt of in your philosophy."—*Alfred Charles Smith; Yatesbury Rectory, Calne, June* 11, 1864.

Song Thrush's Nest on the Ground.—The site which Mr. A. S. Bradby (Zool. 9108) mentions as having been chosen by a song thrush for its nest is, as far as my observation has gone, not at all an unusual one. The bottom of a hedge, or a ledge on the bank of a ditch or stream, is frequently preferred to a bush or tree, perhaps as being less easily found by nest-hunting boys, who in many places (especially near London) are far more destructive than rats or mice. Macgillivray ('History of British Birds,' vol. ii. p. 135) says that the nest "is placed in a thick bush of any kind, or in a hedge, at a small height, or on a rough bank among shrubs or moss. In the unwooded parts of the country it is found under shelter of a projecting stone or crag, or in the crevice of a rock, or at the root of a tuft of heath, or among the stunted willows on the rocky bank of a stream." So also in 'Birdsnesting,' p. 10, it is said to build on the ground; but Yarrell and some other authors take no notice of the occurrence, common as it is.—*Charles Bygrave Wharton; Aspen Lodge, Sudbury, Middlesex, July* 11, 1864.

Lesser Redpole's Nest near Chester.—On the 12th of June, 1864, I found, in a lane near Chester, a lesser redpole's nest. It was built in a hazel-bush, and made of twigs and moss, lined with willow-down. At first I had some doubts as to what species it belonged, but at last I saw one of the old birds, with whose song I am well acquainted. There was only one egg in at the time, and on visiting the nest again I found that it had been pulled. The egg was greenish blue spotted with orange, principally at the large end. Is it not rather far south for this species to breed?—*J. Hamilton; Manchester.*

Nesting of the Mountain Finch or Brambling (Fringilla montifringilla) *in Yorkshire.*—I have before me a nest and egg, with the description of the mother bird, which leave no room for doubt that the brambling has nested this year in a wild state with us. The nest was first noticed in an early stage of its construction, on the 13th of April. It was built at a height of about six feet from the ground, on the side shoots of an oak tree and close to the trunk, the materials employed being principally moss and wool, with an intermixture of brown hair, a few stems of dry grass, and some silky-looking substance which is probably the inner bark of some plant, perhaps a thistle. The lining is of white hair and feathers, beneath which wool shows more abundantly than the moss. There were in all six eggs in it, and the bird was very shy, and soon forsook the nest on finding itself observed. Hewitson's illustration of the egg of the brambling might very well have been taken from the egg now before me, but the peculiar plumage of the bird, which was well and closely observed, renders the identification quite positive. The nest, which was met with in Baldersby Park, near Thirsk, was, together with the accompanying eggs, forwarded to me by the Hon. Guy C. Dawnay, to whom also I am indebted for the careful observations which have enabled me to record this fact.—*J. C. Atkinson; Danby in Cleveland, July* 2.

Extraordinary Arrival of Starlings to Ireland in June. — On the 28th of June I saw three large flocks of starlings come across the sea as if from the Welsh coast, due east, and pass over this island in a westerly direction. The next day four flocks were seen by a fisherman to pass in the same direction. It is nothing unusual for me to see, in severe Novembers and Decembers, thousands of starlings, skylarks, thrushes, fieldfares, redwings, linnets, greenfinches, &c., pass over in the same way from east to west; but to see starlings arriving while the hay is making is quite strange to me. For about a fortnight back I have seen a flock of these birds frequenting some fields in the neighbourhood of the Beggar's Bush Barracks, Dublin. Of this circumstance alone I had intended to send a note, the congregating of these birds so soon as the 18th of June being, I think, unusual. The starling rarely breeds in this locality. I am well aware that starlings, before roosting, fly about their breeding haunts in flocks, but have never before seen them feeding in flocks in the fields so early as the date I mentioned.—*H. Blake-Knox; Bartragh, Dalkey, Co. Dublin, July* 2, 1864.

Avocet near Chichester. — On the 27th of June an avocet was killed in a tide-mill pond at Sidlesham: it proved on dissection to be a male. The gizzard contained nothing but a few small stones. The feathers were much worn. This specimen is now in my collection. I am not aware that a bird of this species has been killed about here since June, 1859, when one was shot in the same pond. — *W. Jeffery, jun.; Ratham, Chichester, July* 8, 1864.

Cuckoo's Egg in Reed Warbler's Nest. — We have not many reeds in this part, consequently the reed warbler is a scarce bird. I only know of one reed-bed near Chichester where it is to be found. In that place last year one man took five or six cuckoo's eggs, and one or two young cuckoos, from nests of the reed warbler. This year he has only taken one nest, and that contained two reed warbler's eggs and one cuckoo's; these were partially incubated; so that either the reed warbler only laid two eggs, or the cuckoo ejected some when it deposited its own. Yarrell does not give the reed warbler in his list of nests in which the egg of the cuckoo has been found, and Morris makes no particular note of it; so that this seems to be an exception to the general rule. Perhaps some correspondent living where the reed warbler is more abundant can enlighten us on this subject. — This was written before I saw Mr. Mitford's note (Zool. 9109).—*Id.*

Occurrence of the Spoonbill in Dublin Bay. — On the 10th of last March I had the pleasure of noting the occurrence of the spoonbill in this Bay. Four examples, evidently much fatigued, alighted upon a rock a few yards distant from the coast. Being in my boat I approached within about ten yards of the rock, and had a magnificent view of these rare visitants. Like the heron, they stood, with crouched heads, upon one leg, the other being buried in the plumage of the abdomen. After sitting thus motionless for the space of about a quarter of an hour, they flew in a northerly direction, most probably to the strand, or "slob," at Dolly Mount. Their flight was from the south-east."—*H. Blake-Knox; July* 2, 1864.

Ringed Guillemot at Flamborough.—On the lofty limestone cliffs of Flamborough thousands of various species of sea-birds congregate during the breeding season. No species is more abundant than the common guillemot, and yet it is quite an exceptional circumstance to meet with its close congener, Uria lacrymans. It is three years since I obtained a specimen of this latter species, and the bird had been shot and stuffed several years previously. It had been shot on the cliffs of Flamborough. On May the 20th of the present year I purchased a fine specimen of Uria lacrymans in the flesh. It had been shot the day before (May 19th), by Robert Cross, of Flamborough, from a boat, as it was sitting on the water just outside the principal cave. It is a rather remarkable circumstance that Robert Cross had been out with a party shooting sea-birds for several hours. They had failed in bagging any bird worthy of special interest, and, having expended all their ammunition, with the exception of a single charge, were returning home. A guillemot was observed by one of the party on the water at the very mouth of the principal cave, and Cross, the owner of the last "shot in the locker," was requested to bring it to bag. This he succeeded in doing, and the bird proved to be an unusually rich specimen of the ring or bridled guillemot, which I have since added to my collection. On dissection I found it to be a mature female.—*W. W. Boulton; Beverley, July* 8, 1864.

Errata.—In my paper on the Birds of Eastbourne (Zool. 9096), for "Ampton Place" read "Compton Place," and for "Boxhill" read "Bexhill."—*John Dutton.*

Proceedings of Societies.

ENTOMOLOGICAL SOCIETY.

July 4, 1864.—A. R. WALLACE, Esq., V.P., in the chair.

Additions to the Library.

The following donations were announced, and thanks voted to the donors:—'Proceedings of the Royal Society,' Nos. 62, 63 and 64; presented by the Society. 'Journal of the Proceedings of the Linnean Society,' Vol. viii. Botany, No. 29; by the Society. 'The Journal of Entomology,' No. 10; by the Proprietors. 'Catalogue of the Coleopterous Insects of the Canaries, in the Collection of the British Museum,' by T. Vernon Wollaston, M.A., F.L.S.; by the Author. 'A Treatise on Insects injurious to Gardeners, Foresters and Farmers,' by Vincent Köllar: translated from the German, and illustrated by engravings, by J. and M. Loudon, with Notes by J. O. Westwood, Esq., F.L.S., &c.; by James Bladon, Esq. 'Sitzbungsberichte der Königl. bayer. Akademie der Wissenschaften zu München,' 1864, I. Heft. 1, 2; by the Academy. 'Exotic Butterflies,' Part 51; by W. W. Saunders, Esq. 'Horæ Societatis Entomologicæ Rossicæ variis Sermonibus in Rossia usitatis editæ,' Fasciculus secundus; by the Entomological Society of Russia. 'The Intellectual Observer,' No. xxx.; by the Publishers. 'The Zoologist' for July; by the Editor. 'The Entomologist,' Vol. ii. No. 3; by the Editor. 'The Entomologist's Monthly Magazine,' No. 2; by the Editors. 'Stettiner Entomologische Zeitung,' Vol. 25, Parts 7—9; by the Entomological Society of Stettin. 'The Journal of the Society of Arts' for June; by the Society. 'The Reader' for June; by the Editor. 'The Athenæum' for June; by the Editor.

The following addition by purchase was also announced:—'Entomographie de la Russie,' par Gotthelf Fischer. Tomes 1—3.

Exhibitions, &c.

Prof. Westwood directed attention to a paper in the second part of the 'Horæ Societatis Entomologicæ Rossicæ' on the parasites of bats: not only were several species of Pulicidæ and of Nycteribia enumerated, but also species allied to the latter, yet differing so much in structure as to necessitate the creation of new genera (or subgenera); he might remind the members present of the extraordinary mode of transformation of Nycteribia, the larva state being passed within the egg, which was not extruded from the body of the female until after the pupa state had commenced.

Mr. A. R. Wallace mentioned that he had found Nycteribiæ in the tropics, but not in large numbers, though probably a sufficient examination would show that each species of bat was infested with its own peculiar species of Nycteribia.

Mr. Tegetmeier exhibited one of the frames from the bee-hive, mentioned in the minutes of the previous Meeting, in which wax had been secreted for the purpose of repairing the old comb and fastening it securely, with a view, as he thought, to future occupation of the hive. He added that the expected swarm had not taken possession, for the recent cold weather had killed the young queens, and the hive from which had issued the bees which did the repairs had not swarmed at all.

Mr. A. R. Wallace inquired what evidence there was of any purpose or design of taking possession of the empty hive? Had not the bees simply obeyed a mere impulse to make wax?

Prof. Westwood asked whether it was certain that there had not been a "false swarm," or that the queen had not been accidentally killed? If Mr. Tegetmeier's hypothesis were true, that the bees, without a queen, had repaired the old combs with the intention of taking possession of them, how was the swarm to compel the queen (who was commonly supposed to lead the swarm) to carry out their design and enter the repaired hive?

Mr. Tegetmeier replied that it was a common occurrence for bees to visit a tenantless hive, in which comb was left, and clear out the refuse, after which a swarm would take possession of the hive: in the present case the existence of the new wax was indubitable, the scales on the floor-board showed that it had been recently made in the hive, and it was found in those places, and those only, in which the old combs had become detached from the sides of the frame and required support. If a queen had entered the hive she would immediately have laid eggs, and the bees would then have remained. He believed that bees somehow or other decided beforehand upon the place of which, on swarming, they would take possession; it was difficult otherwise to account for the perfectly straight and rapid flight of a swarm to a window or other suitable spot, such selected spot being often at the distance of a mile or two from their starting point. His view was that the swarm carried the queen, and not that the queen led the swarm.

Mr. Tegetmeier also exhibited a number of pieces of comb of the honey-bee showing singular formations of cells; the specimens had been picked out of heaps of old combs, and were not the result of special experiment or of artificial manufacture. One piece of comb contained a row of sixteen central (not marginal) cells which were pentagonal, two of the angles being right angles; a second piece contained a group of cells, some pentagons, some hexagons, of various degrees of irregularity, in the middle of a mass of the regular hexagonal form; a dependent piece of old comb had had formed on its edge a number of shallow cells which were nearly hemispherical cups, and which gradually ran into the hexagonal shape where they came in contact with the regular cells of the old comb; other pieces contained cells which appeared to be circular-cylindrical; and a specimen of comb containing three queen-cells had on each of those cells a number of hemispherical excavations. Mr. Tegetmeier was of opinion that the cell of the hive-bee was invariably hemispherical at its commencement, and a section of a cell which was not in contact with other cells was always circular; hemispherical cups or depressions were hollowed out, these excavations were made near to one another, almost in contact, and the bees enlarged them until they came in contact; the enlargement being continued to the full extent possible (or, in other words, the bees gnawing away all the material so far as was consistent with the integrity of the comb), the cells of necessity assumed the hexagonal form. He did not believe that the pressure of contiguous cells upon each other had anything to do with the form of the cell, nor did he believe in the existence of a "hexagonal instinct" or "geometrical instinct" in the bee; the hexagonal form was a consequence of the property of space that, of seven circles of equal radii, six will just surround the seventh; if it had been the case in nature that seven circles would just surround another of equal radius, then the cells of bees, when in contact, would have been heptagonal, instead of hexagonal.

Mr. F. Smith remarked that Mr. Tegetmeier's observation that a cell was invariably commenced as a hemisphere, if true of the hive-bee, was not true of all wasps, those, *e.g.*, which built dependent nests, starting from a flat or plane base.

Mr. F. Smith read the following account, supplied by Mr. S. Stone, of Brighthampton, of the manner in which that gentleman had induced a colony of wasps to construct the series of six nests, of extraordinary shapes, which were exhibited at the previous Meeting of the Society:—

"About the middle of the month of August, 1862, a large nest of Vespa germanica was taken by a person residing at Stanlake, a village adjoining Brighthampton. It was brought home by him, tied up in a handkerchief, and deposited for the night in a room in his house. In the morning word was sent me that if I could go down and fetch it away I might have it. Now it so happened that I could not go that day or the next, so it was allowed to remain where it was; but, as might have been expected, the insects very soon found their way through the handkerchief in which the nest was enclosed, completely riddling it, when a second was tied round it, which of course soon shared the fate of the first. It was then placed in a sack, such a one as those used by farmers or millers, through which they were not long in making their way, although they must have found it tougher work than eating through the handkerchief. The sack with its contents was next put into a hamper and tied down. On the third day I had an opportunity of sending for it, and on its arrival proceeded to remove the different coverings, and make some arrangement for placing the combs contained in the nest (which, in consequence of the treatment to which it had been subjected, was of course in itself a complete ruin) in a more favourable situation for work than the one they then occupied. This was a ticklish piece of work, but somehow or other I managed to separate two or three combs from the mass, which I reduced in size with a pair of scissors, and running a wire through them placed them inside a small square box (No. 1 of the series), the combs resting on the bottom of the box and the wire reaching from thence to the top: I then fixed the box in the window of a room, making an aperture through the back of the box to correspond with one in the window, for the purpose of allowing the insects to pass out and in. The front of the box was of glass, moveable at pleasure, by means of which I could introduce a constant supply of sugar. I now collected together, in the best way I could, the workers belonging to the nest, and introduced them into the box; they numbered, I should think, somewhere about three hundred, and as the box contained only three small pieces of comb it was only possible for a limited number to work at them: the consequence was, that by far the greater number, after providing themselves with materials, were compelled to work wherever they could find room: the wire and all the sides of the box, except the glass front, which was frequently being moved, were speedily covered with the paper-like fabric the produce of their labours. The insects were placed in the box on a Thursday afternoon, and on the following Saturday the work had proceeded, and was proceeding so rapidly that I could perceive if, I let them go on till Monday, the box would be filled with a mass of work without beauty or design, so I determined upon fitting up another box in a somewhat similar way, and causing the insects to pass into it from the one they then occupied. I accordingly cut two or three more pieces of comb, and passing a wire through them suspended them inside a box (No. 2 of the series) of about the same size as the first, and similar thereto in other respects; then by tapping upon and shaking box No. 1, I caused most of the insects to leave it and pass out through the aperture in the window into the open air, then, by means of a sliding door, preventing their immediate return, I took box No. 1 away, and in its place put box No. 2; then, withdrawing the slide, the insects crowded into it and with seeming unconcern began working away as before. The combs not resting upon the bottom of the box, as in the former case, but being raised an inch or two above it, caused the workers to form a structure differing considerably from the first. On the following Wednesday the work had become so far advanced that I found it necessary to provide the workers with a fresh box; a larger one (No. 3 of the series) was therefore procured, and fitted up much in the same way as the last, and the insects were introduced into it in the same way as before; in seven days a structure somewhat resembling the last, but much larger, was raised, when another box (No. 4 of the series) was procured; this was provided with a moveable wooden back, which, when the building was finished, was replaced by one of glass. The box was fitted up in a way quite different from the preceding ones: two rows of pillars formed of wire, four in a row, the rows being about two inches apart, reaching from the bottom to the top, were placed at regular intervals across the box; at the base of each pillar, and also at the top, a small piece of comb was fixed. The filling up of this design occupied the insects fifteen days, when another box (No. 5 of the series) was procured: this was fitted up in a manner differing somewhat from the last; four pillars were placed across the box, a little behind the middle, and two a little in advance, while between the two a short one, three or four inches only in height, was inserted, at the top of which, but not at the base, a small circular piece of comb was placed, while at the bottom as well as the top of the other columns pieces of comb were fixed: the erection of the singularly beautiful structure contained in this box only occupied the workers five days, when a fresh one (No. 6 of the series) was procured, fitted up in nearly the same style as the last: in other five days they raised a structure very similar to the preceding one, when they were shifted into a much larger box, fitted up in nearly the same way as the two previous ones had been, but the weather becoming cold they did not make progress enough to bring their work in this box to anything like perfection.

"One of the chief objects wasps have in view in their building operations is to enclose the combs so as to ensure as high and as uniform a degree of temperature as may be,—a thing essential in the hatching of the eggs and the well-being of the larvæ when produced: thus by placing combs or pieces of comb in particular positions the insects are literally compelled, in their endeavours to cover them in, to carry out the design of the person so placing them.

"One reason why the work was not attached either to the back or front of cases 4, 5 and 6 was, that the pillars or columns were placed at some distance from each of those sides, and as there were no intervening combs, or pieces of comb, to be covered in, the operations of the insects did not extend in either of those directions sufficiently far to reach them during the period they were allowed to remain in each box."

Mr. Stainton exhibited a new Gelechia, allied to G. nigricostella, and for which he proposed the specific name of Lathyri, the moth having been bred by Mr. Brown, of Cambridge, from larvæ which fed on Lathyrus palustris.

Prof. Westwood mentioned that the larvæ found by Captain Cox in a bin of bran, and exhibited at the Meeting on the 2nd of May last, had proved to be Pyralis farinalis.

Paper read.

Mr. Roland Trimen, of Cape Town, communicated a paper entitled "Descriptions of some new Species of Butterflies found in Southern Africa." Sixteen species were characterized, one of which belonged to the Pieridæ, one to Satyridæ, six to the Lycænidæ, and eight to the Hesperidæ. Ten out of the sixteen were discovered by Mr. James Henry Bowker, Inspector of Mounted Police, who for several years has devoted his leisure to the observation and collection of the Flora and Fauna (especially the Lepidoptera) of Kaffraria.

New Part of 'Transactions.'

A new part of the Society's 'Transactions' (Third Series, Vol. ii. Part 1), being the second quarterly Part for 1864, containing Major Parry's Catalogue of the Lucanoid Coleoptera, with descriptions of new, and remarks on some of the rarer, species, and illustrated with twelve plates, was announced as ready for distribution.—*J. W. D.*

Scarcity or Abundance of Wasps in 1864.—I partly agree with my friend Mr. F. Smith (Zool. 9137) as to the causes in this case: at present the wasps are becoming numerous in this locality earlier than usual, owing to the dryness of the spring. I had a nest in my lawn with more than a hundred young wasps on the 1st of July: this is early. Nothing is so inimical to the queen-wasps as a wet spring: they generally make their appearance between the 15th and 20th of April, and should a cold, wet month follow this at least three-fourths of them die. A vast number appearing in April or early in May is no criterion of their abounding at the end of the summer; but I am of opinion that wasps will be very numerous in Gloucestershire this summer, as the nests are being found in great numbers in all directions. Another observation made by me is this, that when on a visit to a friend in Hampshire in August, twenty-five years ago, I found wasps very numerous and mischievous to the wall-fruit; while at the same time, in Gloucestershire, wasps were exceedingly scarce, and no annoyance whatever. I have also found a very open, mild winter, with continuous rain, a very great cause of the diminution of these insects in the following spring, and indeed of all the Hymenoptera. A smaller and darker species, I have noticed, is very rare, and seldom appears except in dry seasons.—*H. W. Newman; Hillside, Cheltenham, July,* 1864.

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